Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXV Chicago, July 2, 1932 Number 13

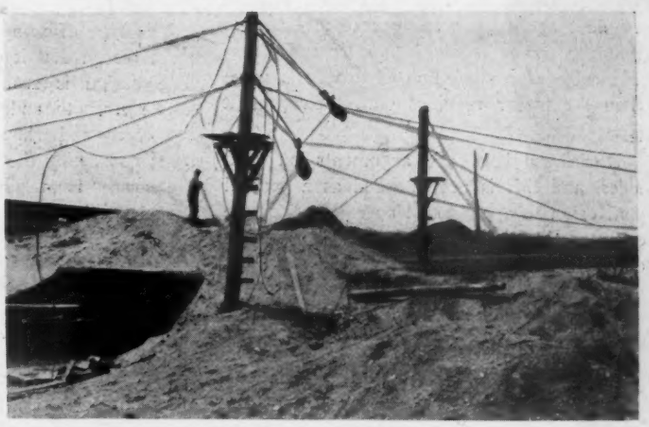
Ingenious Iowa Installation Shows Possibilities of Drag Scraper

Clear Lake Sand and Gravel Company Has Reduced Excavating Problem to Simplest Terms

AS we have tried to emphasize again and again there are at least three classes of sand and gravel plants: (1) the "factory" type of industrial localities where the demand is steady and for various very specific products; (2) the country plant of more or less transient character, depending for business mostly on highway jobs, or some similar type of public works; (3) the regular portable plant, not yet recognized as a legitimate part of the commercial sand and gravel industry.

In the class (2) plant economy or cheapness both in first cost and in operation are prime requisites. Of course, these two requisites are not always found together. The general rule is the better the equipment the lower the cost of operation. But it is in the selection of the type of equipment for the particular operation that real judgment enters. A good example is the plant of the

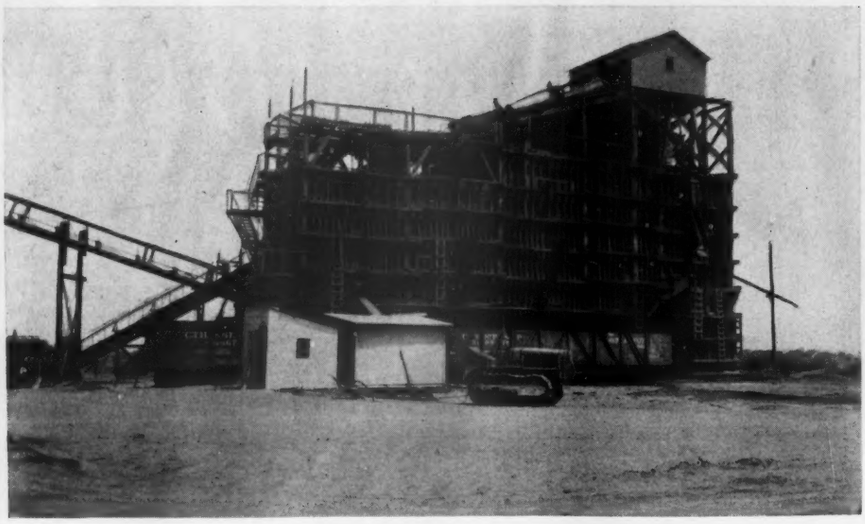
Starting a cut with the drag scraper



Sheave blocks are supported from masts

A closer view of the scraper

The scraper delivers to a long field belt



General view of the sizing and washing plant

Clear Lake Sand and Gravel Co., Clear Lake, Ia., illustrated and described herewith.

Other Types of Excavators Have Been Used

This company is not a new operator. It has used a slackline cableway excavator and a power shovel in its previous operations. A drag-bucket scraper was adopted with the belief that this type of excavator was the most efficient for this particular operation. The reasons given for this choice are: Uniform power at all times; a greater latitude of field operations; the operators maintain that the power required to raise the carrying cable of a slack-line excavator is more than the power required with their present equipment.

Doubtless there are arguments on both sides, and this is not intended as a general conclusion to apply to all operations. These operators know their material. It is a glacial deposit containing about 75% sand and 25% gravel, most of the gravel being of relatively small size, although occasional boulders are encountered. This material can be considered easy to dig when compared with many of the more compact deposits in other localities, or with deposits containing a larger percentage of gravel and boulders.

There is nothing involved about this installation; a two-drum Thomas hoist connected to a 150-hp. General Electric motor through a Link-Belt silent chain drive and a 3-yd. Green drag scraper with the cables are the items of major equipment. Yet this equipment can dig and deliver to the field conveyors 40 railway cars of material per 10-hr. day, which for the investment and power required, labor and upkeep certainly is economical.

The type of scraper was selected for the main reason that it did the work efficiently. The design is such that the scraper has ample strength and rigidity, digs naturally and easily and when full the two top angle irons connecting the front and back prevent the scraper from "digging in" unnecessarily, or overloading itself, thus conserving power.

Output May Be Varied With Speed of Drag

The pull or load speed is an important factor when production is the goal and must be adjusted to meet the requirement of the operator. A fast load haul naturally means a greater production, but at the same time a greater power input results. Similarly with the return speed. These operators use a load speed of 200 ft. per min. and a return speed of 300 ft. per min. A return speed of 600 ft. per min. is considered for future work, should it be desired to increase production greatly. Likewise attention to the size of wire rope is important. The installation as originally made had a ¾-in. return line, which was considered too small, so it was replaced with a ⅞-in. return line. The pull line, originally ⅞-in., was too small and was replaced with a 1-in. cable. American Steel and Wire Co. cables are used. The cables last 60 to 70 days at maximum production.

Drying Material for Belt Loading

As a great amount of the material is taken from below water, the method of operating is rather unusual. Owing to the handling of the material subsequent to the digging operation, it is desirable to have the pit-run material delivered to the field belt with a minimum amount of water content. To do this, during the rush season, it is customary to have a night crew dig from below water and deliver the gravel to a point near the belt feed hopper, but far enough above water level to permit the gravel to drain thoroughly. The day crew then drags the material to the pan feeder serving the field belts. The pit at the time of this description had been excavated to 30 ft. below water level. The return line is 1100 ft. long and the pull line 500 ft., and at times the entire footage has been in use, so a fair idea as to the size of the pit is obtained.

The method of handling the scraper is interesting. Alongside the field hopper serving the belt conveyor, two 10-in. diameter wood posts have been placed, approximately 20 ft. high and about 35 ft. apart. Near the tops a ⅞-in. wire cable connects the two posts. This cable carries a 14-in. sheave for the return line. About 4 ft. below this sheave is a second cable carrying the sheave for the load line. The load line in turn is connected to the lower drum of the two-drum hoist.

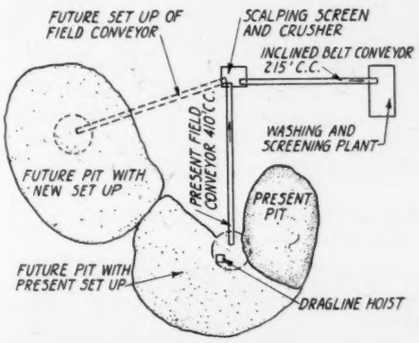
Type of drag scraper used

Tractor is useful in many ways around the plant

The pit has been excavated to a depth of 30 ft. below water

The drag scraper delivers to a hopper over which are spaced rails on 8-in. centers. The hopper is placed over a Diamond Iron Works pan feeder that in turn serves a horizontal, 24-in. belt conveyor, 410 ft. c. to c. This belt delivers to the scalping plant, which in turn deliveres to an inclined belt, 215 ft. c. to c., serving the washing plant. The inclined belt elevates the material 66 ft. to a No. 2, 4-ft. by 8 ft. two-decked, Link-Belt vibrating screen, following which the material passes to Stephens-Adamson rotary screens for final washing and sizing.

In laying out the delivery system from the pit to the scalping screen operations were started at one side of the plant with the idea


FUTURE SET UP OF FIELD CONVEYOR
SCALPING SCREEN AND CRUSHER
INCLINED BELT CONVEYOR 215' C.C.
PRESENT FIELD CONVEYOR 410' C.C.
WASHING AND SCREENING PLANT
FUTURE PIT WITH NEW SET UP
PRESENT PIT
FUTURE PIT WITH PRESENT SET UP
DRAGLINE HOIST

Plan of operation with drag scraper

of working all the material that could be easily obtained at one set-up of the drag scraper, after which the drag would be moved in an arc around the feed hopper, until the entire area had been worked out. Then the field conveyor would in turn be moved in an arc and the operations repeated. In this manner a large area of ground is expected to be cheaply mined and delivered to the plant. By referring to the accompanying sketch the method of operation of the pit is more clearly defined.

The horizontal field belt requires a 25-hp. motor. This belt and the inclined belt were supplied by the Boston Woven Hose and Rubber Co. The carrier and return rolls are Link-Belt.

The two-drum hoist and motor with controls are mounted on skids, permitting the unit to be moved about the field under its own power, or by means of a Caterpillar tractor "20." A simple shed has been built over the operator's platform, the whole being anchored to two "dead men" at the rear and one on each side by means of ¾-in. cable and suitable sheaves.

The entire operation is designed to handle its minimum production with a total of five men, which includes all labor from the time the material is excavated until it is loaded to cars. Larger production would require a few more men at the washing and loading end, however.

The installation was designed cooperatively by Ray Sandry, general manager of the Clear Lake Sand and Gravel Co., and C. B. Sherman of the H. Channon Co., Chicago, Ill.

Liquid Oxygen Explosives

THE RESULTS of a study of liquid oxygen exposives (L.O.X.) made by the Bureau of Mines are given in the bureau's Report of Investigations 3169, recently issued.

Tests were made on its sensitivity to impact, using various carbon black absorbents of different particle sizes, also on the effect of moisture, the effect of adding inert materials, the effect of purity of oxygen and the effect of density of absorbent.

The conclusions were that it is more sensitive to impact than 40% straight nitroglycerin dynamite (used as a standard by the bureau), that moisture has no desensitizing effect, that its sensitiveness to impact is increased by decreased particle size of the absorbent and that its sensitiveness is lessened by decreased purity of oxygen and lowered ratio of oxygen to carbon.

The tests were made by placing the sample on a heavy steel anvil and dropping a weight on it, the maximum height of fall of the weight at which no explosion occurred being the measure of sensitivity. Both 25 and 100 kg. weights were used. The test samples consisted of 1-in. lengths cut from 1¼- by 8-in. cartridges and these were subjected to the impact of the falling weight exactly 30 seconds after removal of the cartridges from the dipping container.

An appendix supplied by E. I. du Pont de Nemours and Co. states that tests have shown L.O.X. to be more sensitive and more hazardous to handle than standard dynamites. It also states that these test results are confirmed by the accident records of quarry loading in this country for the past five-year period, which show one fatal accident per million pounds of L.O.X. as against one fatal accident per 133 million pounds of fixed explosives.

Adsorption of Various Rocks

IN AN INVESTIGATION of adsorption by various rocks used in road building, R. Wilhelmi determined the isotherms of the adsorption of various binders by various mineral powders, by working on dilute solutions of bitumen in C_6H_6. The differences in concentration before and after adsorption were measured colorimetrically. Trinidad asphalt free from mineral matter was most strongly adsorbed, followed in turn by Mexican and California asphalt, and lastly tar. Asphaltenes are much more strongly adsorbed than the oils; hard asphalts, high in asphaltene, are more adsorbed than soft asphalts. The rocks used as fillers were classified in the following order as regards their adsorbing power: Trinidad filler, slate, basalt, porphyry, granite, limestone, kaolin and quartz. From these tests the behavior of the binders in presence of the fillers under pressure and tension can be predicted.—*Chemical Abstracts.*

Feldspar in Canada

SHIPMENTS of feldspar by Canadian producers in March were recorded at 1160 tons, an increase of 45% over the March, 1931, total of 800 tons, according to the Dominion Bureau of Statistics at Ottawa. During the first quarter of 1932 the Canadian production totaled 2905 tons as compared with 1777 tons in the corresponding period of 1931.

Ground feldspar imported into Canada during March amounted to 157 tons, worth $3077.

Asbestos in Canada

THE Dominion Bureau of Statistics at Ottawa reports that the production of asbestos during April amounted to 8830 tons, a decline of 1.2% from the March shipments of 8937 tons and 38.1% from the April, 1931, total. During the first four months of the current year 35,663 tons of asbestos were shippd by Canadian producers as compared with 54,106 tons in the corresponding period of 1931.

Benefits from the Trial Mix

Facts About Making Concrete Aggregate from Which Producers Can Make Capital

By Stanley M. Hands, C.E.
Special Investigations and Research, Division of Highways, State of California

THOSE who are experimenting with trial mixes find that the best workability with the least amount of water for concrete mixtures is often provided by an increase in fine aggregate. Since the improvement in resulting concrete includes higher strengths, the engineer is beginning to appreciate the need for specifying a range of proportions from which the field engineer may select one which is best suited to his particular materials and conditions of control, mixing and placement.

The adoption of this method is fundamentally in the right direction to help the producer of concrete aggregates. The failure to disassociate grading proportions and strength has encouraged orthodox practices in selection of materials. The trial method is providing better concrete and new evidence that grading and proportions are not fundamental strength factors. Comparable quality is being produced on a more economical basis. Troublesome interpretations of specifications are eliminated and markets are made to use material more nearly in proportion to natural occurrence.

Any one of a number of methods of design of concrete mixture provide for a variation of the ratio of fine to coarse aggregates. The range of ratios provided in some specifications which have been reviewed is not great enough to permit the fullest utility and economy of materials which have been used in California. We have knowledge likewise of materials which occur in Iowa for which these ranges are not too great.

No. 1—2½-in. maximum size of coarse aggregate with minimum amount of fine aggregate

No. 2—2½-in. maximum coarse aggregate with more fine aggregate than No. 1

No. 3—This mix contains still more fine aggregate than No. 2 mix

No. 4—Maximum of fine aggregate with finer coarse aggregate is more uniform and of equal strength

Trial mixes showing effect of increase in finer sizes

TABLE OF BATCH WEIGHTS—SIX SACKS PER YARD—ONE SAND AND VARIOUS COARSE AGGREGATES

Batch weights					W	Aggregate cost				Ratio	Strength		
Water	C.M.T. weight	F.A. weight	C.A. weight	Maximum size	Absolute volume dry aggregate	— C	F.A. est. 90c/t.	C.A. est. $1.80/t.	Con. yd. Total	Aggregate cost ratio	F.A. to total aggregate	Comp. 10 da.*	Comp. 28 da.	M.R. 28 da.
303.6	564	1234.0	2195	1½	19.94cf	0.81	$0.556	$1.975	$2.531	99.1%	36.0%	3900	5500	
292.5	564	1252.8	2164	1½	19.86cf	0.78	.564	1.947	2.511	98.3%	36.8%	4100	5175	708
292.5	564	1284.1	2134	1½	19.87cf	0.78	.578	1.92	2.498	97.7%	37.8%	4150	5600	
289.8	564	1309	2104	1½	19.86cf	0.77	.589	1.894	2.483	97.2%	38.4%	4280	5230	
297.6	564	1340	2080	1½	19.86	0.79	.603	1.873	2.476	96.9%	39.4%	4071	5300	
292.5	564	1366	2055	1½	19.88	0.78	.614	1.849	2.463	96.4%	39.9%	.....	5105	764
303.7	564	1466	1952	1½	19.88	0.81	.66	1.757	2.417	94.6%	42.9%	.....	5200	732
296.6	564	1165	2255	2½	19.86	0.79	.524	2.03	2.554	100.0%	34.1%	.....	5050	
296.6	564	1228	2200	2½	19.91	0.79	.552	1.98	2.532	99.1%	35.8%	.....	5563	
296.6	564	1278	2138	2½	19.85	0.79	.575	1.923	2.498	97.7%	37.4%	.....	5410	
296.6	564	1334	2089	2½	19.88	0.79	.60	1.88	2.48	97.0%	39.0%	.....	5086	
296.6	564	1384	2039	2½	19.91	0.79	.623	1.835	2.458	96.2%	40.5%	.....	5425	
296.6	564	1434	1983	2½	19.89	0.79	.646	1.786	2.432	95.2%	42.0%	.....	5450	

*Average 5 to 20 cylinders S. G. CMT. 3.35, FA. 2.72, C.A. 2.78.

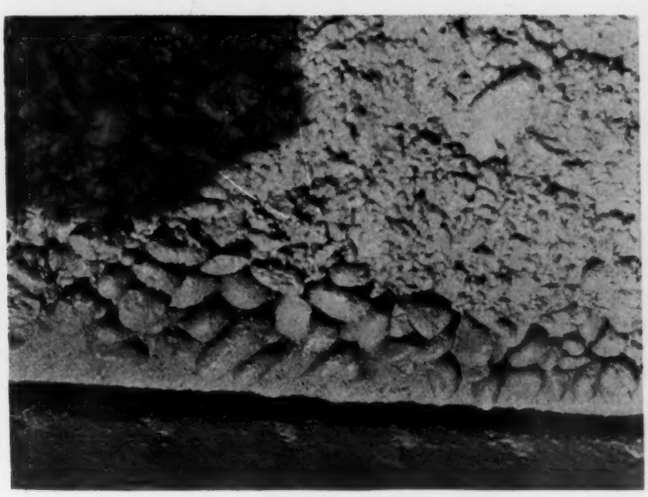
However, that such ranges are being provided for proportions is indicative of the trend of the engineer to utilize the concrete making characteristics of materials. With the pendulum swinging in the right direction unquestionably a more profitable market will be developed for the producer of aggregates.

The state of California, Division of Highways, adopted methods of design based on absolute volume of aggregates in 1925. Rules which were provided to assist the field engineer in the design of concrete mixture have been modified or eliminated from time to time. The experience gained during this period and data which may be secured from the *records indicate that good con-

*T. E. Stanton, materials and research engineer.

No. 1

No. 2



No. 3

No. 4

Progressive segregation of mixtures deficient in fines

The plant design of this mixture was: 6 sks. cement, w/c = .74, 1016-lb. fine aggregate, 2458 lb. coarse aggregate.
Washed samples from center of subgrade gave: 6.75 sks. cement, w/c = .80, 1005 lb. fine aggregates, 2242 lb. coarse aggregate.
Washed samples from side on subgrade gave: 7.21 sks. cement, w/c = .74, 990 lb- fine aggregate, 2220 lb. coarse aggregate.

crete can be made from materials showing a wide range of grading and proportions.

The quality of the concrete has been found to depend upon the ratio of cement to solid volume of aggregates. This is a confirmation of the water-cement ratio law in that the water in a given volume of concrete is practically the difference between that volume and the volume of solids. Therefore if the solids can be maintained or increased by changing the ratio of fine to coarse aggregate the resulting concrete can be workable to a certain extent and water can be eliminated to improve the quality. The amount of solid material which may be used for concrete of normal consistency depends upon the character of both the fine and coarse aggregate. That aggregate which contributes most to the solid volume will be used in greatest quantities consistent with workability. The fact that for most mixes the coarse aggregate comprises most of the mix does not mean that this is fundamental. Sands can be regraded or blended with finer sands and used to replace harsh coarse aggregates with equal success, providing proper consideration is given to absolute volumes. The coarse gradings are best for those mixtures containing the most cement, but if the cement is reduced the finer grading of sand should be adopted. Many interesting developments have resulted. Orthodox practices are much abused, but better concrete is being made.

The preceding table of batch weights indicates the manner of setting up in convenient form a series of mixes which is proposed for trial. The proportions are designed for a single sand and for either one or two sizes of coarse aggregate. The mixes are actual mixes and were found to be of approximately the same wetness and plasticity. Any one of the mixes could be used for pavement concrete. They do not all provide equal workability for variable conditions of placement. Segregation is greater in some of these mixes than in others. The selection of one of these mixes for use in the field would not be difficult by the trial method. Those mixes estimated to cost the least are the most foolproof and uniform in quality.

A study of the quantities required for the different batches will verify the opinion that the trial method should prove of very material benefit to the producer and contractor. Increasing the amount of fine aggregate has made a more workable, foolproof mixture of uniform quality in which small variations in grading are not important and at a considerable saving in cost to the contractor.

History of Explosives Industry

THE INSTITUTE of Makers of Explosives announces a change in price in the recently completed "History of the Explosives Industry in America," which was prepared by Arthur Pine Van Gelder and Hugo Schlatter. The original price of the history was $10 and the present price, as announced by the Institute, will be $5.

Feret on Concrete Strength Relations*

THE MONOGRAPH, "Resistances of Concretes to Impact, Wear and Scaling Compared to Their Resistances to Compression, Flexion and Tension," is a reprint of the articles by R. Feret which appeared in the *Revue de Materiaux ue Construction* (Paris) in 1929 and 1930. There are 72 large pages, of which about one-half is given to the author's own tests and conclusions and the other to a summary of work on the same lines by other well-known investigators.

The book is closed with a list of the author's writings. It is interesting to note that his first studies were of color sensation and color blindness (1885-1886). But in 1890 he published the first of the articles which have made him world famous, "A Note on Divers Experiences Concerning Concrete." More than 150 books, brochures and magazine articles followed, all dealing with cements, limes, mortars and concrete. If one had them all he would have a fairly complete history of the development of modern designed concrete and also in the development of cementitious materials, not only portland cement but natural, slag and aluminous cement and hydraulic and other limes. All these were investigated in the study of mortars reported in this monograph, although naturally the emphasis is placed on portland cement.

As all who have studied the matter know, the relations between compressive and flexural and tensile strength are not simple. One type of aggregate may show a high compressive strength and a comparatively low flexural strength, while another may show high or low strengths in both flexion and compression. The work of the Bureau of Public Roads and of Goldbeck has brought this out very plainly. Still, for all aggregates, and, as Feret shows in this study, for all cements, there is a general relationship. In his study of mortars made with many different "liants" he found the flexural strength to be almost double the tensile strength in all cases, that is, 1:1.95. The compressive-tensile and compressive-flexural relations, however, are plotted as curves, the equations being: $T = 0.82R^{2/3}$ and $F = R^{2/3}$, R being the resistance to compression and T and F the resistances to tension and flexion. So, too, a relation was found between compressive strength and shock and wear. The results, to quote the report, "seem to classify the various concretes according to their resistances to compression." Which is to say, simply, that good concrete made of high-grade materials will be found to be about as strong in one way as it is in another.

It is in this publication that Feret announced (p. 39) as his contribution to the investigation of concrete strength that the compressive strength has a straight line relationship to the cement-water ratio by weight, the equation taking the form,

$$R = K\,(C/E - H),$$

C/E being the cement-water ratio and K and H constants. This is, of course, only another way of stating the water-cement relation, and some investigators have said it is not so accurate as Abrams' formula, as the relationship is only approximately straight line. Feret himself says that for the purposes of design he prefers his older well-known and tested formula.

In the part reviewing the work of others, results are taken from 20 studies of concrete and mortar made in Germany, Italy, Switzerland, Russia and the United States. The American papers quoted are by Bates, Wig and Davis, Abrams, Gonnermann and Schumann, and Gonnerman and Timms. A cursory examination is enough to show that while the relations found by other investigators do not all correspond with those found by Feret, the principle is the same. That is, while Feret's figures give the formula $F = R^{2/3}$ for the flexural-compressive strength relation, the figures of Ros (Switzerland) would show it to be $F = 1.17R^{2/3}$, and Gonnermann and Schumann's figures show it to be $F = 0.98R^{2/3}$. These and even much wider variations are shown by Feret to be partly due to conditions of curing, methods of molding specimens, and so on. But differences in the cements used appear to be a larger factor. A table in the recapitulation shows this (the mortar strengths are in kg. per sq. cm.):

Cement	D	C	B	A
Tensile str.....	28.3	29.4	33.4	35.2
Comp. str.....	79.0	137.0	210.0	313.0
Ratio, T:R..	0.358	0.214	0.159	0.113

These cements, the report says, were all bought in the open market, although only the last two appear to be like ordinary portlands.

In his final summary M. Feret says that he feels that tests in flexure (bending) and tension do not particularly represent the resistances to the forces which concretes are called upon to withstand in actual work, and that the figures furnished by compression tests should be more nearly proportional to the real resistance developed by the concrete.

*Résistances des Betons au Choc, à l'Usure, et au Decollement Compareés à leurs Résistances à la Compression, à la Flexion et à la Traction. Par R. Feret, Chef du Laboratoire des ponts et Chausses à Boulogne-sur-Mer. Revue des Materiaux de Construction et de Travaux Publics, Paris, 1930.

Iowa Geological Survey

THE 38TH annual report of the Iowa state geologist for 1929 has been issued. The report contains five papers which may be of interest to some rock products producers. They are, "Further Studies of the Pleistocene Geology of Northwestern Iowa," by J. Ernest Carmen; "The Dakota Stage of the Type Locality," by A. C. Tester; "The Stratigraphy of the Kinderhook Series of Iowa," by Lowell R. Laudon; "The Natural Molding Sands of Iowa," by John E. Smith; and "Mineral Production in Iowa in 1928 and 1929," by James H. Lees.

Quarrying and Crushing Methods and Costs at the Santa Catalina Island Quarry of Graham Bros., Inc., Santa Catalina Island, California*

By Geo. Adams Roalfe†

Consulting Engineer, Graham Bros., Inc., Long Beach, Calif.

SANTA CATALINA Island lies about 25 miles to the southwest from Long Beach. It is approximately 20 miles long and about 5 miles wide at its widest point. The rocks which compose it are almost entirely igneous. Their formation was the result of at least two major lava flows, one of which is exposed over most of the southern end of the island. The rock has been classed as andesite and is the material quarried. The topography is rough. Steep cliffs, intersected by precipitous canyons which lead to the ocean, rise abruptly from sea level. A few canyons extend out under the sea, making small harbors or bays.

The quarry was opened on a ridge forming a side of one of the less precipitous canyons. This location was selected because of the availability of good stone close to the beach and its accessibility from the city of Avalon, the largest community on the island.

*Reprinted from U. S. Bureau of Mines Information Circular 6609.

†One of the consulting engineers, U. S. Bureau of Mines.

As is true of most igneous rocks in this region, the andesite is heavily fractured. In this particular area the overburden of soil is light. On the ridges it averages only a few inches, and even in the bottom of the gullies it is rarely over 3 ft. thick. From this it is seen that overburden has not been a particularly heavy problem.

In appearance the rock varies in color from a light buff through gunmetal blues to dark bottle-green. In the large unfractured masses the buff-colored material lies next to the seams and merges to either of the other types in the center of the mass. The buff-colored rock has been partly altered and is not as valuable as the darker material; however, it will successfully stand critical comparison with other rocks used commercially in this territory. The product of the quarry is a mixture of the various types noted and results in an excellent aggregate.

Clay is found filling the seams. This is largely an alteration product of the feldspar in the rock. When the quarry was first opened much material was wasted in disposing of this clay. Research disclosed that it made an excellent material for crusher-run road base. In grading it approaches the ideal for waterbound macadam and contains approximately 10% of fine clay thoroughly disseminated through the mass. If it were possible to balance the demand for crushed rock and quarry waste with the quantities produced it would not be necessary to waste any material. During the calendar year 1930 nearly one-third of the total tonnage sold was disposed of as crusher-run road base material.

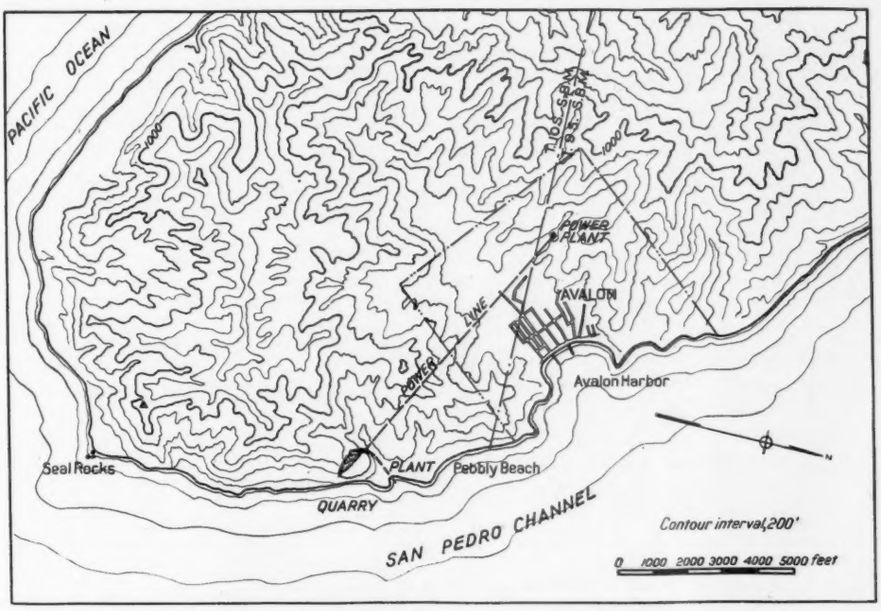


Fig. 1. Topographic map of portion of Santa Catalina Island

Brief History and Early Development of Quarry

Prior to 1924, Graham Bros., Inc., had operated as general contractors, gradually entering the field as material distributors. Up to this time their production was limited to that from a sand pit on Signal Hill, adjacent to Long Beach. Other deliveries of aggregates were made from purchased production. In 1923 William Wrigley, Jr., owner of Santa Catalina Island, became interested in the business, and it was in this year that the Santa Catalina Island quarry was opened and the crushing plant constructed. Demands for material even before the plant was completed were such that a temporary gravel recovery plant was set up at Pebbly Beach adjoining the quarry site. The gravel from this plant was transported by barges to the mainland at Long Beach. The topography of that portion of Santa Catalina Island which includes the quarry and the townsite of Avalon is shown on Fig. 1. Fig. 2 shows the route taken by the barges and the relation of the quarry to the Long Beach distribution plant. The opening of the quarry and construction of the plant was carried out under the direction of Paul Graham, whose idea had led to the selection of the Santa Catalina site for the operation. The plant was formally opened and placed in operation on January 19, 1924, and has been running successfully since that date. The activities of Graham Bros., Inc., have expanded since 1924 until they now operate seven plants and distribute materials from two others.

Physical Characteristics

The variation in color of the rock has been described. Tests to determine the compressive strength of the stone give the following results:

CRUSHING STRENGTH, LB. PER SQ. IN.	
No. 1 dark blue	14,615
No. 2 green	23,010
No. 3 buff	7,295
Average	14,973

The test specimens were 2-in. cubes. The average specific gravity of the types shipped is 2.63.

Aggregates in this territory are tested for abrasion resistance and toughness by the Los Angeles rattler test. The Los Angeles rattler consists of a cylindrical drum 28 in. in diameter and 20 in. long, mounted horizontally on a shaft and having a shelf 4 in. wide extending from end to end inside.

The charge consists of 11 lb. (5 kilograms) of aggregate of such size that all passes a 2-in. circular opening, 60% is retained on a ¾-in. circular opening, and all is retained on a ½-in. circular opening, together with 14 cubical blocks of cast iron having rounded corners and edges and weighing a total of 11 lb. After charging, the drum is turned at a speed between 28 and 30 r.p.m. The loss is reported as the per cent. of the sample which will pass a 10-mesh sieve after 100 and 500 revolutions, respectively.

Santa Catalina crushed stone when subjected to this test gives the following average results:

Revolutions	Loss, per cent.
100	4.24
200	10.38
300	12.66
400	14.20
500	19.20

Maximum losses permitted under local specifications vary from 30 to 50%. Data are not available for comparison with other standards.

The chemical composition of the rock has not been an important factor other than in determining its resistance to destruction when used as an aggregate in fireproof concrete. The stone falls in class A for this use. A chemical analysis of the commercial rock follows:

	Per cent.
SiO_2	61.05
Al_2O_3	18.30
Fe_2O_3	3.49
FeO	1.11
MgO	2.59
CaO	7.75
Na_2O	4.06
K_2O	1.36
MnO	Trace
TiO_2	0.09
P_2O_5	Trace
	99.80

Method of Exploration

Due to the nature of the deposit, unlimited tonnages are available. Prospecting of outcrops enabled satisfactory conclusions concerning persistence and quality to be reached, as the deposit is exposed not only at the top but also in the adjoining canyons. As most of the area under consideration is entirely free from overburden, the choice of location was most influenced by factors favorable to the building of the plant and to handling the product.

Mining Methods

The site selected adjoined a wide canyon opening on the beach and was about 200 ft. above sea level. Early work was done close to the plant and gradually extended around the ridge. One of the considerations which led to moving southward was the discovery of silver-lead-zinc ore in a fracture in the original quarry opening. This ore was worked by the Santa Catalina Island Co. for a number of years until the price of the metals fell below a profitable figure. At present work is carried on principally at the southerly end of the quarry, although the face has been carried back along its entire length from time to time. Since opening the quarry, approximately 2,500,000 tons have been handled. The quarry face now has a length of approximately one-half mile and averages about 400 ft. in height with a maximum of over 500 ft. The only preliminary development work required consisted of leveling a bench of suitable dimensions. As the quarry is an open-face operation, it has been possible to carry a level floor so that the trackage problem has been simple.

Figs. 1, 3 and 4 show the location of the quarry with reference to the crushing plant, a plan and profile of the plant, and the track layout. Due to the elevation of the quarry floor above the crusher plant and sea level, the disposal of waste material has been easily accomplished.

Stripping

The limited amount of overburden has been mentioned. On one or two occasions it was considered advisable to remove the soil, which averaged less than 2 ft. in thickness. This was done with teams and scrapers.

Drilling and Blasting

The quarrying methods in use vary little. All major shots are made with coyote holes at the quarry floor level and well holes at the top. Fig. 5 gives a typical coyote-hole layout and Fig. 6 a cross section of the quarry face showing the relation of the coyote hole to the top holes. In driving a coyote hole a tunnel is first driven at right angles to the quarry face to a depth of 50 ft. From this two crosscuts are made parallel to the face, each ordinarily 45 ft. long. In a coyote hole of the usual type pockets to carry the explosive are located 15 ft. each side of the entrance tunnel and at the ends of the crosscuts. This method of shooting has produced the best fragmentation in primary blasting.

All drilling is done with air hammer drills, two of which are mounted on tripods for the tunnel and drift work. A driller and a helper are employed on each of these two drills. All the other air hammer drills are operated by one man. Top holes are drilled with churn drills to a depth of 100 ft. The number drilled for a shot varies from two to five. Steel used for air hammers is either 1- or 1¼-in. dressed square point.

Subsequent to the major shots, minor shots are often made by drilling snake holes into the face at the quarry floor level as deep as 35 ft. These holes are sprung with 40% gelatin. With this type of shooting no top holes are used.

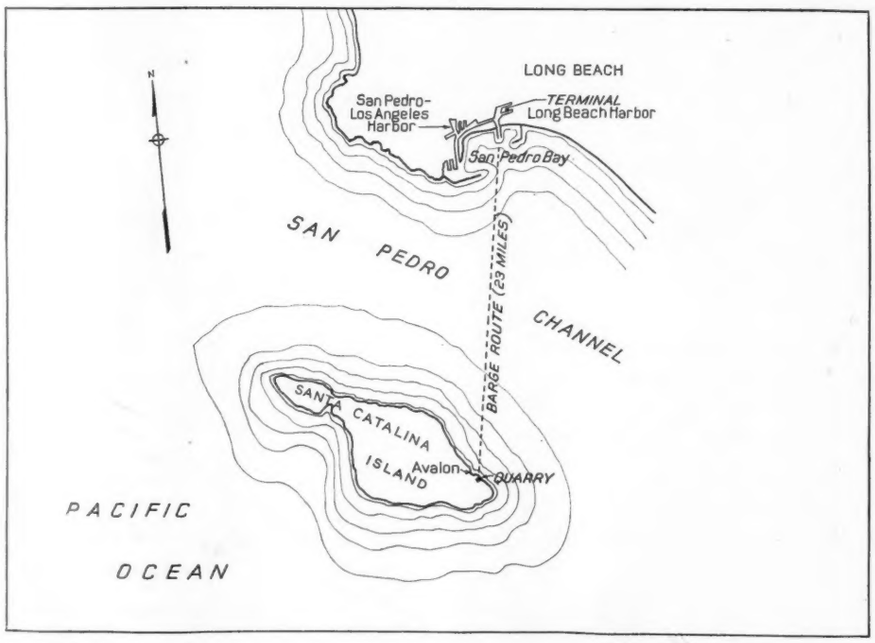


Fig. 2. Map showing rock-barge route between Santa Catalina Island quarry and Long Beach, California

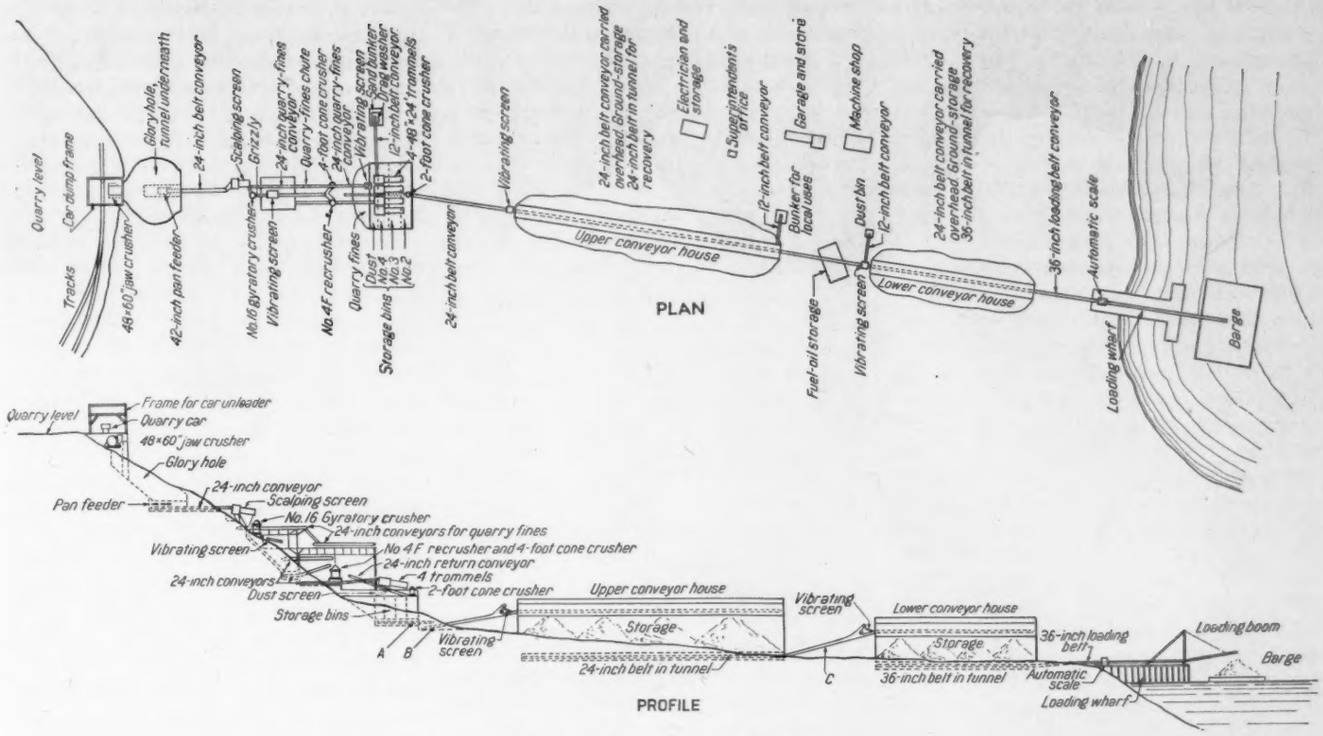


Fig. 3. Plan and profile of plant

All rock more than 3 ft. in size is broken by secondary shooting. Some of this is done by bulldozing, but most of it is done by drilling shallow holes and shooting with 40% gelatin. All secondary shots are fired with fuse and detonators. Few of the large pieces require more than one hole to break to the desired size.

The coyote and well holes are loaded with bulk dynamite and nitro-starch powders, although some black powder is used. Primary shooting costs average slightly more than one-third of total shooting costs. The labor cost for drilling is about equally divided between primary and secondary shooting.

Loading

Loading of stone or waste is done by two No. 37 caterpillar steam shovels. They are fitted with buckets of 1½ cu. yd. capacity. When in unbalanced production—that is, when it is necessary to waste some of the quarried material—one of the shovels is used to load waste while the other is loading rock. The shovels operate on fuel oil and consume approximately 400 gal. per shift each. Fuel is ordinarily taken on at the middle of the shift when the operations are shut down.

Transportation

All materials are transported in trains of dump cars. The motive power is furnished by three 8-ton gasoline locomotives. Ten cars are in use, six of one type and four of another, all of side-dump design. Tracks are laid with 50-lb. steel and with standard side-throw switches. Fig. 4 shows the track layout. The locomotives use 15 gal. of gasoline per shift and require 5 gal. of lubricating oil every two weeks when operating for one shift. The average haul is 3000 ft. Fig. 7 is an organization diagram which shows the operating personnel.

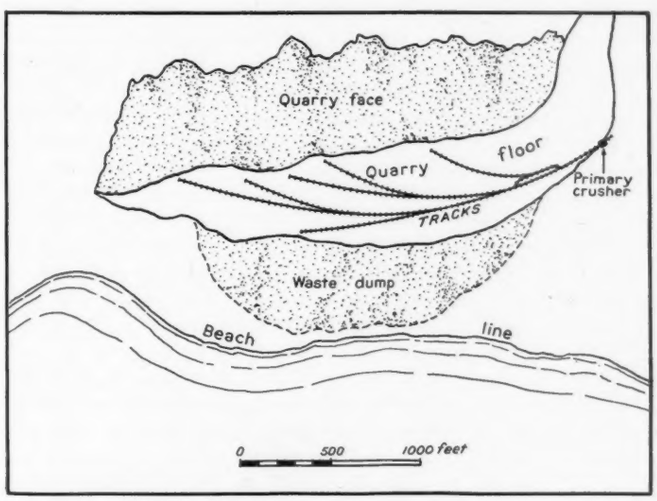


Fig. 4. Plan of quarry, showing track layout

Drainage

Drainage of the quarry does not offer any particular problem, but in the canyon where the plant is located the run-off during heavy rains is extremely rapid, so that portions of the plant have required walls and light riprap for their protection.

Crushing Plant

A plan and profile of the plant is shown in Fig. 3 and its flow sheet in Fig. 8.

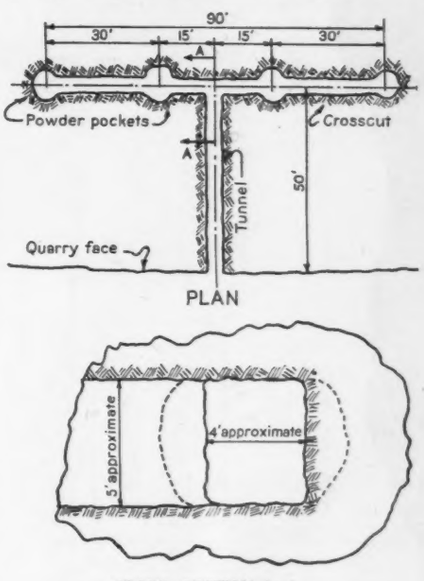


Fig. 5. Typical coyote hole

Loaded cars arriving from the quarry are received on a platform above the primary crusher and level with the quarry floor. They are dumped by a specially designed car dump, operated by a 7½-hp. motor, into a steel-lined hopper feeding the primary crusher. The primary crusher is a 48- by 60-in. jaw crusher driven by a 200-hp. motor through a continuous rope drive. This unit is set to crush to 8 in. and discharges into a glory hole or receiving bin, which, together with a recovery tunnel underneath, have been blasted out of the solid rock. From the glory hole the material is fed by a 42-in. pan feeder, driven by a 7½-hp. motor, to a 24-in. belt conveyor, 75 ft. between centers, traveling 180 ft. per min. and having a capacity of 300 tons an hour. This conveyor is driven by a 7½-hp. back-geared motor and carries the rock to the scalping screen. The original belt, installed when the plant was built, was in operation throughout 1930. The scalping screen, driven through bevel gears, is a 60-in. by 16-ft. trunnion-type trommel set on a slope of 1½ in. per ft., making 12 r.p.m., and fitted with a jacket for one-half of its length. The trommel shell in 1-in. manganese steel has a life of 400,000 tons. The main screen shell has 5-in. holes. The jacket has 1½-in. circular openings. The tonnage passing each screen varies within wide limits, depending on the immediate product required by the market. The material passing the outer jacket is carried on two 24-in. belt conveyors, 70 ft. and 60 ft. in length, to the quarry-fines bin. Both belts are level and travel 180 ft. per min. They were installed in 1930 and are still in use. The material passing the 5-in. circular openings and rejected by the 1½-in. openings is by-passed around the secondary crusher by chutes. (See Fig. 3.) The oversize is fed directly to the secondary crusher.

A No. 16 gyratory set at 2½-in. discharge opening is used as the secondary crushing unit and is driven by a 75-hp. motor. The product of this crusher is fed by gravity over a home-made 4- by 5-ft. flat-bar grizzly with 2-in. spacing. The oversize drops to the by-pass chute and the undersize to a double-decked 4- by 8-ft. vibrating screen mounted on a slope of 2½ in. to the foot. The upper deck is fitted with 1½-in. and the lower with 1-in. square-meshed cloth. No. 8 wire is ordinarily used. The tonnage passing this screen varies within wide limits.

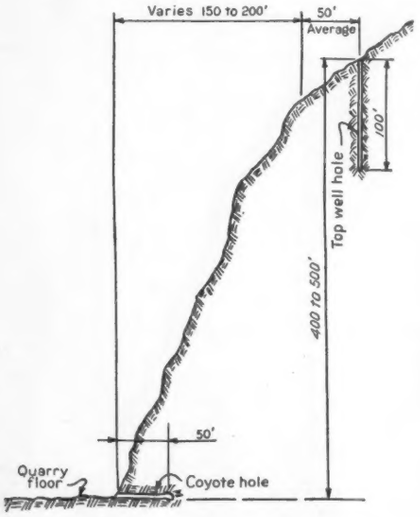


Fig. 6. Cross-section of quarry face, showing position of holes in typical shot

The oversize material is fed through the by-pass chute to a 24-in. conveyor 60 ft. between centers, the first 15 ft. of which is level and the balance of which is on a slope of 12 deg., delivering to the reduction crushers. The speed of this belt is 200 f.p.m. The oversize on the lower deck is discharged into the No. 3 bin below or sent to the next vibrator, as required for grading.

The undersize through the lower deck is delivered to a vibrator screen set on a slope of 2½ in. to the foot and fitted with No. 8 wire cloth to remove dust and excess fines. This wire cloth lasts from 60 to 120 days. The percentage passing this screen varies over wide limits. When handling thoroughly dry material the load is relatively light, as the bulk of the fine material is then removed at the scalper. When wet or damp this screen takes out as much as 30% of its feed. The oversize from this screen is discharged to the No. 3 bin below. The fines are either discharged to the dust bin below to be combined with crusher-run base material, or are fed to a 12-in. belt conveyor 220 ft. between centers traveling 150 f.p.m., which delivers them to a drag washer. This belt is rarely used, however. The washing plant is mounted over a sand bunker to which the washed material is discharged. As there is no good sand on the island, this product has been used to supply local requirements.

The oversize from the vibrator is conveyed by the 24-in. belt conveyor from the by-pass chute to the reduction crushers. These consist of one 4-ft. cone crusher driven by a 100-hp. motor through a short V-belt drive and set at 1½-in. discharge opening, and a 4F gyratory crusher belt-driven by a 60-hp. motor and set at 1½-in. discharge. The proportion of sizes in the finished product is controlled by the proportionate split of the feed between the two units, as well as by their respective settings. Their product is conveyed by two horizontal belt conveyors 190 ft. between centers, extending from under bins below the vibrator screens, one passing under each reduction crusher. The conveyors each travel 190 f.p.m. and are driven by a 7½-hp. motor. They deliver to a bank of four 48-in. by 24-ft. trommels. Between these two belts and drawing oversize from the vibrator is a 6 deg. inclined 24-in. conveyor, 55 ft. between centers, which feeds the reduction crushers. It is driven at 180 f.p.m. by a 5-hp. motor, belt-connected. These screens are operated in pairs, one pair caring for each of the reduction crushers. Normally, all of the trommels are fitted with a jacket for one-half their length. The jackets have ½-in. round openings. The main shell has 1½-in. round openings. The screens are of the trunnion type, driven by bevel gears at the receiving end. The two outside screens are driven by 15-hp. motors and the middle pair by 20-hp. motors through a belt drive. The main shells are ¾-in. thick and the dust jackets ½-in. The screens are set on a slope of 1½-in. to the foot and rotate at 12 r.p.m. The life of the shells is about 10 months.

The products of these screens fall by gravity into their respective bins and are known in the trade as No. 2, No. 3 and No. 4 rock, the No. 2 rock being the largest size. The oversize from the trommels is discharged by gravity to a 2-ft. cone crusher with discharge opening of 1-in. mounted on the top of the storage bins and belt driven by a 50-hp. motor. The product of this unit is returned to the trommels by an inclined conveyor belt 24 in. wide and 80 ft. between centers, rising 20 ft. in its length and driven by a 10-hp. motor at 180 f.p.m. The operation described is typical; however, larger or intermediate gradings can be made if necessary.

Storing and Shipping

The units just described are mounted on top of the storage bunker, which has four pockets running transversely. At its upper end an additional pocket formed by the sloping surface of the hill and the end of the storage bunker is used for the crusher-run base material. Next to it, in the first pocket, is stored the fines from screening when they are not used for sand as previously described. The next pockets in order hold the three sizes of crushed rock from No. 4 to No. 2. Only a small percentage of the production is utilized on the island, the balance being shipped to the Long Beach distribution terminal. Due to the absence of appreciable local requirements it has not been necessary to provide blending facilities. Since its opening this plant has shipped the three sizes of rock separately. The making of only three sizes was decided on because it reduced the necessary segregation to a minimum and decreased overlap in grading, thus permitting close control of mixes so as to conform to specifications. In many instances the control of mixes has been actuated by the desire to provide low-void aggregates, a field in which this company was the pioneer in this territory. The sizes of rock described are the standard sizes made, although on occasion if the tonnages justify it larger sizes are made.

Passing under the storage bunker is a concrete-lined recovery tunnel. Material being recovered is drawn from the bins to a 24-in. belt conveyor 50 ft. center to center (*A*, Fig. 3), driven at 200 f.p.m. by a 15-hp. motor which discharges to another 24-in. belt conveyor (*B*, Fig. 3) 400 ft. center to center

and driven at 200 f.p.m. by a 25-hp. motor which elevates and carries the material to storage under the upper conveyor house. Unusual precautions are taken throughout the plant to remove dust from the crushed rock. In carrying out this object, the upper conveyor-house belt at the top of the elevating incline is carried around two pulleys and discharges its load onto a 4- by 5-ft. vibrating screen set on a slope of 3 in. to the foot and driven by a 1-hp. motor. The purpose of this screen is to remove dust and fines. It is usually fitted with No. 10 wire cloth.

The upper conveyor house is supplied with a mechanical tripper running on rails. The space under the belt is divided into four distinct storage areas. One space each is assigned to the three separate sizes of rock and the fourth to the crusher-run base or quarry waste to which the rock-dust recovered in the crushing plant is added. An additional fixed tripper is located above the vibrating screen to divert, when desired, material to a 1000-ton 4-compartment bunker which cares for local deliveries. This material is handled on a 24-in. by 50-ft. belt, driven at 175 f.p.m. In the conveyor house is a large blower which is used to remove dust from the material being discharged by the movable tripper.

Directly underneath and centered with the conveyor is a concrete-lined tunnel. The material in storage is recovered through gates of the tipping-chute type fitted with rubber skirts in the roof of the tunnel, and is loaded to a 24-in. belt conveyor, 550 ft. center to center, part of which is inclined at 20 deg. (*C*, Fig. 3) running under the full length of the upper conveyor house and through the lower conveyor house. This belt is driven by a 30-hp. motor.

As in the case of the upper belt, at the top of the incline it is carried around two pulleys, discharging its load on a vibrating screen for further removal of dust. This screen is similar to that on the first reclaiming belt. The dust recovered is conveyed to a small dust bunker by a 24-in. by 40-ft. belt driven at 150 f.p.m. by a 5-hp. motor. At present, tests are being made to determine the usability of this dust as a portion of the mix for a clay-products plant located adjacent to the quarry and operated by the Santa Catalina Island Co. This lower conveyor belt is also fitted with a portable tripper running on rails. The space below is similarly divided into four storage compartments for the separate materials.

Under the lower conveyor house and running its full length is a concrete recovery tunnel. The material is removed from this storage by a 36-in. belt conveyor, 400 ft. center to center and driven at 200 f.p.m. by a 60-hp. motor, which passes over an automatic scale. After passing the scale the conveyor extends across the dock and out to the end of a boom over the water. From this point the material falls by gravity to the waiting barge.

The loading of barges involves a number of features not usually encountered. The location of the loading dock is on the open ocean, on the lee side of the island. While in ordinary weather there are no distinct breakers on the beach, a marked surge is present even on the quietest day. This condition makes it impossible to warp the barges to the dock. Anchors and buoys have been installed so as to hold the barge in position for loading; these are placed at a sufficient distance to give the play necessary to take care of the rise and fall due to swells. The loaded barges are towed to Long Beach by the Wilmington Transportation Co. with Diesel-powered tugs. With the exception of a few days in each year it is possible to load and transport material at all seasons. The barges are usually towed in pairs across the channel, but an additional tug is used to handle the second barge in the harbor. With the exception of one barge which has lines similar to a sailing vessel, all are of the square-end type. In all cases they carry a deck load and vary in capacity from 700 to 1000 tons.

Repair and Drill Sharpening Shops

Minor repairs are cared for at location. Near the superintendent's office is a small shop equipped with a machine lathe, drill press, small tools, and welding outfits. Drills are sharpened in a combination compressor and drill sharpening house which is equipped with an oil-fired furnace and a tool sharpener.

Water Supply

Two sources of water supply have been developed and utilized. Fresh water for use in the steam-shovel boilers is obtained from one of the mines up the canyon, from which it is piped to the quarry level. Due to its character, the water must be sent through a

TABLE 1. LABOR AND WAGE SCHEDULE

Classification	Department	No.	Rate per hour	Monthly salary	Hours per shift	Days per year
General superintendent	Quarry and mill	1	.....	$350	....	.....
Quarry foreman	Quarry	1	.....	300	....	.....
Blacksmith	Quarry	1	$0.85	.....	8	300
Blacksmith's helper	Quarry	1	.55	.....	8	300
Compressor operator	Quarry	1	.75	.....	8	300
Steam shovel operator	Quarry	2	.....	250	....	.....
Steam shovel firemen	Quarry	2	.75	.....	9	300
Steam shovel pitmen	Quarry	2	.60	.....	8	300
Hoistman	Quarry	1	.60	.....	8	300
Locomotive drivers	Quarry	3	.60	.....	8	300
Trackman	Quarry	1	.75	.....	8	325
Powderman	Quarry	1	.75	.....	8	300
Drillers	Quarry	8	.60	.....	8	300
Muckers	Quarry	4	.50	.....	8	300
Master mechanic	Mill	1	.....	250	....	.....
Handyman	Mill	1	.50	.....	varies	varies
Mill labor boss[1]	Mill	1	.70	.....	8	300
Mill labor boss[2]	Mill	2	.60	.....	8	300
Mill labor boss[3]	Mill	10	.50	.....	8	300
Electrician	Mill	1	.85	.....	varies	varies
Labor boss	Storing and shipping	1	.....	200	....	.....
Labor	Storing and shipping	3	.....	150	....	.....
Labor, extra	All departments	....	.50	.....	....	.....

[1] In charge of mill operations on the second shift.
[2] One on each shift.
[3] Six on day shift and four on night shift.

TABLE 2. SUMMARY OF COSTS

Santa Catalina Island Quarry. Period January 1, 1930, to December 31, 1930.
Total material shipped: 409,283 tons.

	Cost per dry ton of stone shipped					
	Labor	Power	Fuel	Explosives	Supplies	Total
Drilling: Primary	$0.0206	$0.0135	.....	.....	.....	$0.0559
Secondary	.0218					
Blasting: Primary	.0045	.....	.....	$0.0193	.....	.0545
Secondary				.0307		
Loading	.0353	.....	$0.0074	.....	.....	.0427
Hauling	.0184	.....	.0035	.....	.....	.0219
Undistributed quarry[1]	.0044	.....	.....	.....	$0.0063	.0107
Crushing	.0688	.0239	.....	.....	.0275	.1282
Screening		.0047	.....	.....		
Conveying		.0033	.....	.....		
Storage	.0308	.0056	.....	.....	.0095	.0459
Loading						
Undistributed mill[2]	.0253	.0023	.....	.....	.0202	.0478
Direct administration	.0147	.....	.....	.....	.....	.0147
Total operating direct	$0.2446	$0.0533	$0.0109	$0.0500	$0.0635	$0.4223
Depreciation	.....	.....	.....	.....	.....	.1324
Royalty	.....	.....	.....	.....	.....	.0798
Compensation insurance	.....	.....	.....	.....	.....	.0195
Total operating cost	.....	.....	.....	.....	.....	$0.6540

[1] Includes foreman, and repairs to shovels, locomotives, cars, etc.
[2] Labor cleaning plant, power for lights, water system, etc.

treatment plant, but this procedure has practically eliminated boiler-water troubles. Salt water is obtained from the ocean and is used in the fire-protection system, for wetting down the yards in dry weather, and in the sanitary system. It is supplied at the rate of 15,000 gal. per hour by means of a triplex pump of 7-in. bore, 10-in. stroke, 44 r.p.m., driven by a 40-hp. motor.

Compressor Plant and Air Lines

The compressor house is located on the quarry floor level. It is equipped with one 14x12-in., one 12- by 10-in., and one 10- by 10-in. compressor with individual motor drives totaling 250 hp. The air is delivered at 100 lb. per sq. in. through a system of pipe lines along the entire quarry face. The first 800 ft. is 3-in. pipe, and the next 1600 ft. is 2-in. size. Bleeders are placed every 600 ft. and tees are put in the line at convenient points for 1½-in. feeders to the quarry. A small air line is carried through the crushing plant for use in blowing out accumulated dust when cleaning up.

The compressors used are as follows:

One 14- by 12-in., 100 hp., 268 r.p.m.
One 12- by 10-in., 75 hp., 245 r.p.m.
One 10- by 10-in., 75 hp., 268 r.p.m.

Power Supply

With the exception of the steam shovels and locomotives, all power used in this operation is furnished by electricity. This is obtained from a central generating station in Avalon operated by the Santa Catalina Island Co. All the power is generated by Diesel-driven dynamos. It is transported at 11,000 volts about 1½ miles over a high-tension power line to a group of three 250-kilowatt transformers on the quarry level, where it is stepped down to 440 volts.

TABLE 3. SUMMARY OF COSTS IN UNITS OF LABOR, POWER, AND SUPPLIES

Santa Catalina Island Quarry. Period January 1, 1930, to December 31, 1930.

Material shipped during period: 409,283 tons.

Labor (man hours per ton):	
Drilling	0.072
Blasting	.006
Loading	.069
Haulage	.034
Miscellaneous	.003
Supervision	.007
Total quarry labor	0.191
Labor, per cent. of total cost	57.5
Power and supplies:	
Explosives (pounds per ton)	0.51
Total power (kw. h. per ton)	4.85
Air compressors	1.23
Pumping	0.11
Crushing	2.17
Screening	0.43
Conveying	0.30
Storage	0.51
Shops	0.06
Lighting	0.04
Fuel (barrels per ton)	0.014
Other supplies, per cent. of total	51.0

Supplies and power are 42.1% of direct cost and 27.2% of total operating cost.

This analysis is based on tonnage shipped.

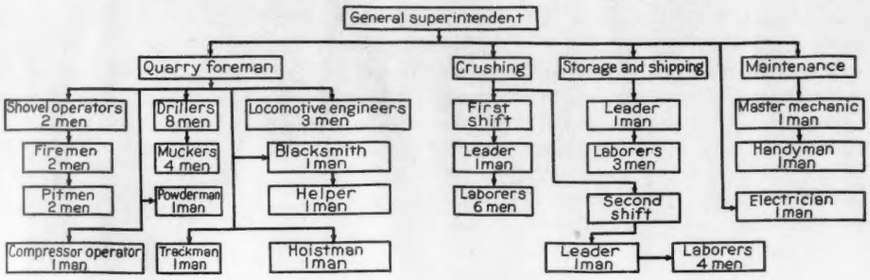


Fig. 7. Organization diagram

Fuel

The steam shovels are fired with 14-gravity fuel oil. This is transported in bulk from the mainland. Between the upper and lower conveyor houses is a fuel tank, from which the fuel oil is pumped to the quarry level by a 3- by 6-in., duplex, 2½-in. suction, 2-in. discharge pump driven by a 5-hp. motor at 39 r.p.m.

General Operation

The policy of the company has been to produce the best possible materials which

TABLE 4. DETAILED AVERAGE SHOVEL COSTS, DIRECT OPERATION

(Average of two identical shovels)

Santa Catalina Island Quarry. Period from January 1, 1930, to December 31, 1930. No. 37 Marion steam shovel, caterpillar. 1½ cu. yd. bucket.

Material handled:	Tons
Rock and quarry fines	204,640
Waste	63,200
Total	267,840

	Rock and quarry fines		Waste		Total
	Amount	Cost per ton	Amount	Cost per ton	Cost per ton
Engineer	$2,292.00	$0.0112	$ 718.00	$0.0112	$0.0112
Fireman	1,411.87	.0068	445.11	.0068	.0069
Pitman	1,136.83	.0056	351.47	.0056	.0056
Other operating labor	663.09	.0033	204.53	.0033	.0033
Total operating labor	$5,503.79	$0.0269	$1,719.11	$0.0269	$0.0270
Fuel and lubricants	1,156.96	.0057	357.39	.0057	.0057
Total	$6,660.75	$0.0326	$2,076.50	$0.0328	$0.0326

Note—The total figure of $0.0326 per ton on total tonnage handled would become $0.0427 per ton shipped, as in Table 2.

Repairs and other miscellaneous charges on all equipment used in the quarry operation amount to $0.0063 per ton shipped or $0.0048 per ton handled. This account is undistributed and therefore the portion chargeable to direct shovel operation could not be determined and is not included in the above schedule.

TABLE 5. DETAILED SUMMARY OF COSTS OF DIRECT OPERATION

Santa Catalina Island Quarry. Period from January 1, 1930, to December 31, 1930.

	Rock and quarry fines, 409,283 tons		Waste, 126,400 tons		Total, 535,683 tons
	Amount	Cost per ton	Amount	Cost per ton	Cost per ton
Total all shovels (Table 3)	$13,321.50	$0.0325	$ 4,153.00	$0.0329	$0.0326
Drilling:					
Operating labor	14,812.87	.0362	2,540.73	.0201	.0324
Power	4,717.20	.0115	808.12	.0064	.0103
Total drilling	$19,530.07	$0.0477	$ 3,348.85	$0.0265	$0.0427
Blasting:					
Labor	1,675.20	.0041	166.57	.0013	.0034
Explosives	18,597.68	.0454	1,864.32	.0148	.0382
Total blasting	$20,272.88	$0.0495	$ 2,030.89	$0.0161	$0.0416
Hauling:					
Locomotive drivers	3,395.24	.0082	1,045.20	.0082	.0082
Locomotive fuel	1,094.67	.0027	337.82	.0027	.0027
Track labor	1,415.13	.0035	437.13	.0035	.0035
Dump labor	943.20	.0023	291.42	.0023	.0023
Total hauling	$ 6,848.24	$0.0167	$ 2,111.57	$0.0167	$0.0167
General charges[1]	4,205.68	.0103	165.60	.0013	.0082
Grand total	$64,178.37	$0.1567	$11,809.91	$0.0935	$0.1418

[1] Includes cost of direct administration, repairs, and other miscellaneous costs.

Note—the above total cost per ton referred to tonnage shipped becomes $0.1857.

can be profitably marketed. Since opening this plant, operations have altered only in the direction of perfecting practice. As all processes are dry, it is necessary to use every practical means to remove dust from the product. In the early period of the plant's operation material now marketed as crusher-run base was almost entirely wasted, but research into the possibilities of marketing it, followed by an intensive educational campaign setting forth its excellent physical properties, has resulted in considerable sales. This crusher-run base consists essentially of a well-graded crushed rock mixture with sufficient finely disseminated clay to bind and thoroughly cement it. Below is given an average analysis of the material, together with the clay content and its distribution.

AVERAGE SCREEN ANALYSIS AND CLAY CONTENT OF CRUSHER-RUN BASE

Size Passing:	Retained on:	Amount, per cent.	Clay content, per cent. of total	Clay, per cent. of fraction
1½-in. circle,	½-in.	12.7	0.3	2.4
½-in. circle,	¼-in.	19.1	0.8	4.2
¼-in. circle,	10-mesh	25.0	0.7	2.8
10-mesh,	20-mesh	14.4	1.0	6.9
20-mesh,	30-mesh	4.7	0.5	10.6
30-mesh,	40-mesh	4.6	0.6	13.0
40-mesh,	50-mesh	3.2	0.4	12.5
50-mesh,	80-mesh	3.7	0.6	16.2
80-mesh,	100-mesh	2.2	0.3	13.6
100-mesh,	200-mesh	3.6	0.8	22.2
200-mesh		6.8	3.8	56.0
Total		100.0	9.8	.....

The opening of a market for this product, which has consistently grown each year, has had a double advantage. Much less of the material shot down is wasted and it is not so necessary to make a sharp cut between sound rock and waste in the upper portions of the crushing plant. The sale of crusher-run base has economically justified more stages of dust removal and has thus materially improved the quality of the crushed rock.

The grades of rock produced have varied somewhat. During the past two years most of the production has been in the three sizes of which screen analyses follow:

No. 2 ROCK

Passing:	Retained on:	Per cent.
2½-in. circle	2 -in. circle	63.8
2 -in. circle	1½-in. circle	27.1
1½-in. circle	1 -in. circle	9.1
		100.0

No. 3 ROCK

Passing:	Retained on:	Per cent.
1½-in. circle	1-in. circle	40.8
1 -in. circle	¾-in. circle	38.8
¾-in. circle	½-in. circle	15.6
½-in. circle	¼-in. circle	4.8
		100.0

No. 4 ROCK

Passing:	Retained on:	Per cent.
½-in. circle	¼-in. circle	49.7
¼-in. circle	10-mesh	50.3
		100.0

Mixes with either 2½-in. or 1½-in. maximum size are consistently delivered with voids below 38%.

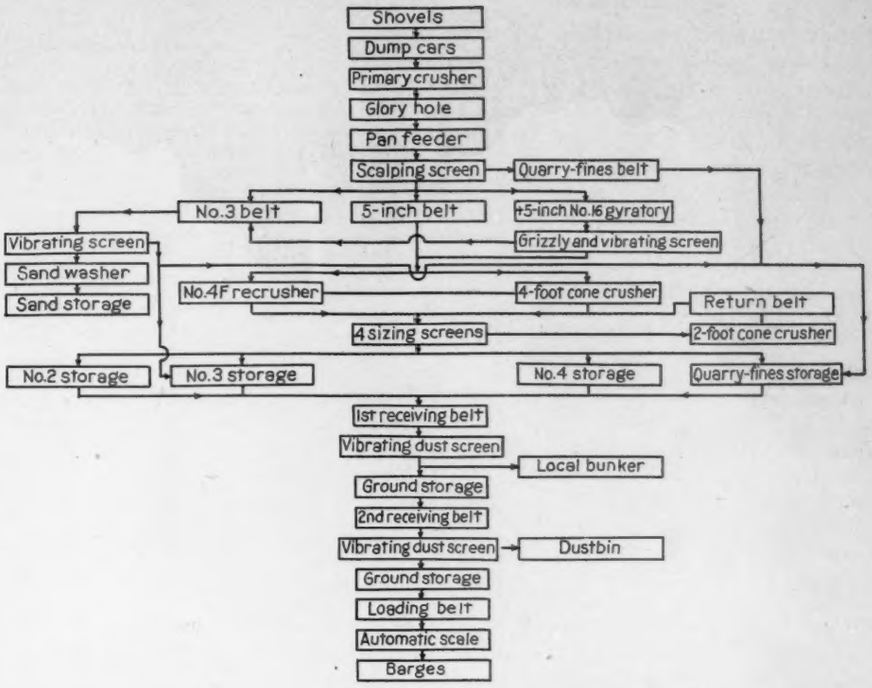


Fig. 8. Flow sheet

PER CENT. EXTRACTION

	Per cent.
Crushed rock delivered to the mainland	48.9
Material delivered locally	4.2
Quarry fines delivered to the mainland	23.3
Waste	23.6
	100.0
Recovery	76.4

Fig. 9 shows the quantity and size of material shipped by months during 1930.

During 1930 the quarry floor crew worked for only one shift, during which they were able to produce and deliver sufficient material for a 2-shift mill operation. The primary crusher can easily care for this load. During the second shift, material is withdrawn from the glory hole and secondary storages and passed through the recrushing units.

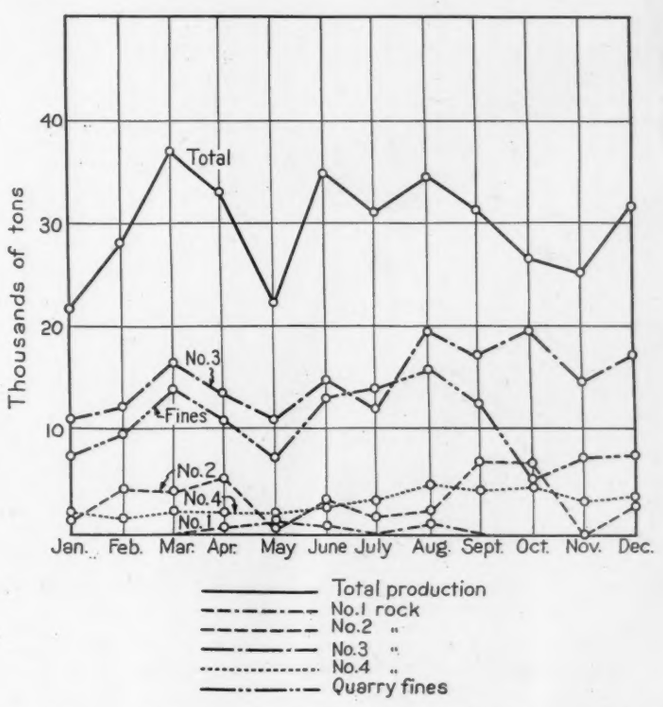


Fig. 9. Production chart for 1930. Material shipped to mainland

Safety Methods

The quarry and mill are subject to three separate sources of safety inspection. The State of California, through the Industrial Accident Commission, maintains an effective and rigid inspection and control of operations of this character; the compensation insurance carrier also makes periodic inspections; but probably the most effective safeguard is the work of the company's own safety engineer. All the activities of the Santa Catalina Island Co. and Graham Bros. (Inc.) on Santa Catalina Island are under the supervision of the same safety engineer. He has worked out a system for grading based on cleanliness, efficiency, and effort to improve. Each month a report is made showing the relative standing of the various activities. Any foreman or superintendent who does not maintain his rating at 95% or better is discharged. An operation is considered as satisfactory if it maintains an average standing of 95% or better. The quarry and mill had a general average for 1930 of 98.6%. A 100% rating is given only when conditions are exceptionally fine and is accompanied by an honorable mention in the monthly report. This operation had such honorable mention three times during the year. One man each at the quarry and mill is made reponsible for reporting any unsafe condition.

Administrative Organization

The general superintendent is in complete charge of the quarry, mill, and shipping. On the quarry floor and in incidental activities such as those of the blacksmith shop, water-treatment plant, compressor house, handling and storing of explosives, and transportation and dumping of material, the general superintendent is ably assisted by the quarry foreman. In the mill each stage of crushing is in charge of one of the workers. There is a foreman in the storage and shipping department. All maintenance and repair work is supervised by the master mechanic or electrician in their respective fields. Fig. 7 is an organization chart which shows the personnel. This chart includes the men employed on the second shift in the mill.

TABLE 6. LIST OF MOTORS, SANTA CATALINA ISLAND QUARRY

1—100-hp. sleeve-bearing, driving 14- by 12-in. compressor. Short-belt drive.
1— 75-hp. sleeve-bearing, driving 12- by 10-in. compressor. Short-belt drive.
1— 75-hp. sleeve-bearing, driving 10- by 10-in. compressor. Short-belt drive.
1— 2-hp. electric, ball-bearing, emery wheels, in blacksmith shop.
1— 5-hp. ball-bearing, used on top of quarry face to hoist steel for well drills.
1— 10-hp. ball-bearing. Car-dump hoist.
1— 5-hp. sleeve-bearing fuel pump.
1—200-hp. ball-bearing, driving 48- by 60-inch. jaw crusher. Belt drive to countershaft, rope drive countershaft to crusher.
1— 75-hp. ball-bearing, driving No. 16 primary breaker belt drive.
1— 15-hp. ball-bearing, driving scalping screen. Belt drives motor to countershaft, countershaft to screen.
1— 10-hp. driving double-decked shaker screen. V-belt drive.
1— 7.5-hp. ball-bearing, driving pan feeder from glory hole.
1— 7.5-hp. ball-bearing, driving 36-in. conveyor from pan feeder.
1— 5-hp. ball-bearing, driving 24-in. conveyor from shaker screen.
1— 5-hp. ball-bearing, for dust collector driving No. 1 fan.
1— 5-hp. sleeve-bearing, driving quarry fines belt from scalping screen.
1— 3-hp. sleeve-bearing, driving machine-shop equipment.
1—100-hp. ball-bearing, driving No. 4 cone crusher. Short drive.
1— 60-hp. ball-bearing, driving No. 4 recrusher. Belt drive.
1— 50-hp. ball-bearing, driving 2-ft. cone crusher. Belt drive.
1— 15-hp. ball-bearing, driving west screen sizing.
1— 15-hp. ball-bearing, driving east screen sizing.
1— 20-hp. ball-bearing, driving middle east sizing.
1— 20-hp. ball-bearing, driving middle west sizing.
2— 7.5-hp. ball-bearing, driving two belts to sizing screens.
1— 7.5-hp. ball-bearing, driving conveyor to sand washer.
1— 10-hp. ball-bearing, driving No. 12 fan.
1— 5-hp. ball-bearing, driving belt feeding No. 4 recrusher and cone crusher.
1— 5-hp. oversize screens to 2-ft. cone crusher.
1— 25-hp. sleeve-bearing, driving long belt, upper storage house.
1— 15-hp. ball-bearing, pick-up belt feeding upper storage-house belt.
1— 5-hp. sleeve-bearing, driving belt to local demand bunkers.
1— 1-hp. sleeve-bearing, driving vibrating screen.
1— 10-hp. ball-bearing, driving fan. Direct drive.
1— 30-hp. ball-bearing. Lower storage house.
1— 5-hp. ball-bearing. Dust belt from vibrating screen.
1— 1-hp. sleeve-bearing, vibrating screen.
1— 60-hp. ball-bearing, driving loading belt.
1— 40-hp. sleeve-bearing, salt water pump.
1— 10-hp. ball-bearing. Barge winch.

Canadian Nonmetallic Minerals in March

DATA on the production of nonmetallic minerals in Canada in March, 1932, have been issued by the Dominion Bureau of Statistics and include the following:

PRODUCTION OF LEADING MINERALS IN CANADA

	March, 1932	Three months ending 1931—March—1932	
Asbestos, tons	8,937	39,842	26,833
Cement, bbl.	276,172	1,369,362	782,831
Feldspar, tons	1,160	1,777	2,905
Gypsum, tons	11,858	39,990	23,074
Lime, tons	29,108	79,986	76,425

English Quarrying Operation

AN INTERESTING METHOD of quarrying limestone is noted in a recent issue of *The Quarry Managers' Journal*, London, England. This is at the Warmsworth Cliff Limestone Quarries near Doncaster, York, in northern England.

The quarry, which is operated by Lockwood, Blagden and Crawshaw, Ltd., is an old one, having been worked in the days of the Romans. The stone is a magnesian limestone and the face is 60 to 100 ft. high.

At the quarry floor a series of parallel tunnels are driven back some 50 ft. into the rock and are connected at the back by a tunnel parallel to the face so that the rock rests on pillars. The pillars are then drilled with air drills and loaded and shot at one time so that the rock above is brought down by its own weight.

This is stated to be a most economical method as only about 30-lb. of gelignite are used for 1000 tons of stone. The longer the rock hangs the better, as it pulls more stone when it does come. The largest fall took a week to come down and brought down 40,000 tons of stone with only 80 lb. of gelignite.

Lime is burned in a Hoffman type continuous kiln, part of which is 40 years old. The kiln has 29 chambers which are separated by doors so that the flames are forced down to the floor and uniform burning obtained. Each chamber is fired about a day, then cooled, emptied and recharged. The kiln has an output of 240 tons per week with double fires and 140 tons per week with single fires. The fuel ratio is about 560 lb. of coal per ton of lime.

Abrasive Materials Industry in 1931

THE YEAR 1931 was one of decreased output of most of the miscellaneous natural abrasives, an advance summary issued by the Bureau of Mines reports. Pumice and pumicite, however, showed an increase of 10.2% in quantity sold or used in 1931 with a decrease in value of 5.3% from that recorded in 1930, according to reports furnished by producers. With few exceptions lower selling prices were reported by producers of abrasive materials in 1931, compared with 1930.

In addition, there were manufactured and sold during the year 44,368 short tons of artificial abrasives.

QUANTITY AND VALUE OF NATURAL ABRASIVES USED IN UNITED STATES

Commodity	1930 Short tons	1930 Value	1931 Short tons	1931 Value
Emery	555	$ 5,996	(*)	(*)
Garnet	5,003	314,129	2,946	$193,015
Grinding pebbles and tube-mill lining	3,480	50,816	2,024	26,211
Grindstones	14,559	423,835	6,994	221,272
Millstones, chasers and dragstones	.....	17,702	.....	†7,030
Oilstones, whetstones, hones, scythe-stones and rubbing stones	651	137,184	370	81,951
Pulpstones	4,141	346,736	1,730	120,877
Pumice	56,843	336,099	62,669	318,223
Tripoli	32,439	507,505	26,682	310,131

*Not yet available. †Partly estimated.

If You Would Sell Lime, Make Use of These Facts!

Baltimore & Ohio Railroad Is "Sold" on Boiler Water Treatment—Maybe Others Can Be Sold

THE last seven years have witnessed a revolution in the condition of the locomotive water supplies on the Baltimore and Ohio that is as complete and possibly as effective in its results as any program of water supply improvements that has ever been made on any other road in a similar period of time. The extent of the improvements, which have been largely in the form of water treatment and improved pumping facilities, is seen in the fact that 113 treating plants have been put in operation on the road since 1923, and automatic electric pumping has been established at 58 points within that same period.

Under normal conditions, approximately 19½ million gallons of water are treated daily on the B. & O., from which it is estimated that approximately 28,700 lb. of incrusting solids and mud are removed. On this basis, approximately 4675 tons of such solids are being removed each year from the boiler waters used on the road. Applying a most conservative estimate of the savings made in locomotive boiler maintenance for each pound of incrusting materials and mud removed, the total annual saving being effected on the B. & O. runs well over $1,000,000, on an investment in treating plants and equipment of about $3,000,000. On one division of the road it has been established definitely that the savings effected in a year of normal operations, as a result of the complete treatment of all bad waters used, except at a few branch line points, exceeds by at least one-quarter the total capital investment in treating plants on the division.

Lime-Soda Treatment Predominates

With only two major classes of bad waters on the B. & O., acid and hard waters, both of which can be treated successfully by the lime-soda ash process, which is also effective in removing silt, this method of treatment has been adopted extensively. As a matter of fact, of the 123 plants on the system 115 are of this type, while 8 are of the zeolite type. The lime and soda plants, which are mainly of the Graver, American Water Softener and Roberts water motor types, are more or less similar in appearance and design, varying principally in the method of chemical control. Essentially, they include a treating tank and a treating plant building housing one or more chemical mixing vats, a supply of dry chemicals and the necessary piping and chemical proportioning equipment.

While there are still a number of pumping and treating plants on the B. & O. which require full-time attendants owing to the type of pumping equipment in use or the constantly varying character of water pumped, the installation of automatic electric pumping, combined with treating equipment which is automatic in operation except for the charging of the chemical vats, has made it possible to put treating plant attendants on a part-time basis at a large number of points. At these plants the routine work, which consists largely of making periodic tests of the character of the water being pumped and the preparation of chemical charges, is usually assigned to a regular employe, such as a section foreman or station agent, who can give the necessary amount of time each day to treating plant duties, either within or after regular working hours.

Operation of the Treating Plants

Ordinarily, the amount of time required at the plants is confined to one visit daily and ranges from a few minutes to about an hour, depending upon the size of the plant and the character of water tests necessary. The main factor in determining the frequency with which a plant must be visited is the degree of stability in the character of water pumped, since practically all of the plants are so designed that a single charge of chemicals is sufficient to permit treatment over a period of 24 hours. At many points, where changes in the character of the raw water are seasoned or gradual, one visit of the attendant each day is sufficient, but at other points, where the character of the water is known to change frequently and rapidly, two or more visits may be required of the attendant daily to make water tests. Ordinarily, the soap test alone is required, following which adjustments are made in the rate of chemical dosage if necessary.

The intermediate daily visits to many of the plants consume a considerable amount of time, but are much more economical than maintaining full-time attendants, and at the same time insure, within practical limits, that a degree of treatment commensurate with the character of the water pumped will be maintained. To do other than make periodic daily tests of the water pumped at certain plants on the road would. to a large extent, reduce the ultimate effectiveness of these plants and, in most cases, result in under or over treatment of the water during certain periods of each day.

A check on the work of the plant attendants and the character of the water

Useful Facts

THE June issue of "Railway Engineering and Maintenance" (Chicago, Ill.) has a 5-page article headed: "B. & O. Is 'Sold' on Water Treatment." Some pertinent extracts of interest and value to lime manufacturers are reproduced herewith.

While it can be safely assumed, probably, that all important railway operating officials have seen the original article, it would be a fine thing to add to the portfolios of every lime salesman.

An editorial in the same issue of "Railway Engineering and Maintenance" says, in part:

"The article on the water treatment program of the Baltimore and Ohio offers a measure of the development that has taken place in this phase of railway transportation in the last few years and affords further evidence of the growing appreciation of the managements of the importance of good boiler waters. However, a water-treating plant is not like a bridge, which retains its value so long as it is kept in repair. Any system of water conditioning, whether it involves softening plants, roadside dosing plants or interior treatment, must be given constant supervision to insure that the desired economies will be realized from month to month.

* * * * * *

"It is characteristic of the history of water treatment throughout the 30 years that it has been a factor in railway operation that unflagging supervision is the price of success. But in these days of severe stress there is a constant pressure for retrenchment — for reductions in the supervision of treatment, for the shutting down of treating plants, or for the substitution of one kind of boiler treatment for another that costs less. Any of these measures affords a means of showing an immediate saving, but all of them may easily give rise to actual losses that will more than offset the reduction in expenditures charged to treatment."

pumped at the different plants is maintained through weekly reports of daily operations required of the attendants. Furthermore, a corps of water service inspectors representing the engineer of tests are constantly on the road visiting the different plants periodically and going over the individual water problems at each plant with the plant attendants. Minor adjustments of the mechanical and electrical equipment at the plants are frequently taken care of by the attendants, but all major adjustments and repairs are made by regular division repair forces.

Marked Effect on Locomotive Maintenance

All evidence and statistics on treating plant operation and the results being effected on the B. & O. point to tangible and intangible benefits of large proportions, but detailed statistics have never been compiled for the road as a whole. However, the actual economies being effected, as far as they can be determined, have been so developed at a sufficient number of individual plants, and on the Toledo division as a whole, as to remove all doubt with regard to the large return resulting from water treatment.

The most outstanding effect of the general policy of water treatment has, quite naturally, been in reduced locomotive boiler maintenance and improved locomotive performance. Whereas it was necessary formerly to wash locomotive boilers over the system on an average of every 10 to 15 days, and on the Toledo division every 7 to 10 days, boiler washing periods over the road generally have been extended to 30 days, and this operation is now carried out in connection with scheduled locomotive inspection under regulations of the Interstate Commerce Commission. On the Cumberland division alone, under normal conditions, it is estimated that approximately 800 boiler washings are being eliminated each year.

The life of boiler flues and side sheets, which was greatly limited prior to the practice of water treatment owing to pitting and the accumulation of scale, has been greatly extended. On the Toledo division, for example, flue life ranged from about 8 to 13 months and complete new sets of flues were required after about 13 months of service, whereas the life of flues has now been extended to about four years.

Supplementing the savings which are being effected in boiler maintenance are those being derived from more intensive locomotive utilization and, of no small importance, through a reduction in the amount of fuel consumed. The latter saving, reflecting only that part derived as a result of water treatment, is estimated at from 7 to 10%.

Potential Lime Tonnage in the Field of Sanitation*

By W. V. Brumbaugh
Assistant Secretary, National Lime Association

SANITATION, in the broadest meaning of the word, includes the devising and application of practical measures for the preservation and promotion of public health. It therefore covers such activities as water purification, trade waste treatment, removal of noxious gases and dusts from the air, sewage treatment and garbage disposal.

An increasing amount of recognition is being given to the importance of correctly solving these problems, as is evidenced by the fact that an entire issue of *Chemical and Metallurgical Engineering* was recently devoted to a summary of the work being done at the present time.

Many of the leading technical and industrial associations are concerning themselves with various phases of this vital subject. Last October the Chemical Section of the National Safety Council discussed the hazards to life and property that sometimes result from inadequate waste disposal and the December meeting of the American Institute of Chemical Engineers centered around a symposium on stream pollution and industrial wastes. It is significant to note the interest being taken by the chemical engineering profession as it forecasts the adoption of chemical treatment of sewage—a logical and economical departure from the involved biological processes now in use.

A Great and Growing Development

The treatment of sewage—that phase of sanitation around which the rest of this discussion will be built—has in itself attained the proportions of a giant industry. The cost of sewage-treatment plants constructed in the past five years and contemplated during the next eight is staggering. Floyd W. Mohlman, one of the country's authorities on sewage disposal, and now serving as chief chemist and director of the Sanitary District of Chicago, is authority for the statement that Chicago has already expended $96,000,000 with a future program for the next eight years of $169,000,000, all definitely established by order of the United States Supreme Court. The North Side treatment works is the largest plant of its kind in the world, with a capacity for handling 200,000,000 gal. of sewage per day.

The estimated cost of New York's first large plant on Ward's Island is $19,000,000. Milwaukee's activated-sludge plant cost $9,000,000 plus $18,000,000 for intercepting sewers. Cleveland has voted a bond issue of $14,000,000 for an activated-sludge plant and on the occasion of a recent visit to this city, I learned that $3,000,000 worth of the bonds have been sold and the construction work is already under way. Many other large treatment works costing from $1,000,000 to $5,000,000 have been built during the past decade.

While it is true that sewage treatment involving the use of separate sludge digestion has made rapid strides during the past five years, this is brought about by a desire to produce a better effluent which can be discharged into the nearest body of water with a minimum undesirable effect, rather than because of the fertilizer value of the sludge, which had been the goal of many plants in the past. At the Ward's Island plant in New York, it is planned to dispose of most of the sludge by dumping at sea, which indicates that the real problem is the disposal of sewage solids at the lowest possible cost. For this and other reasons, the proposed plan of present-day experimenters to burn the sludge in connection with a chemical precipitation plant using lime, has real merit.

Lime Already Used

A study of the U. S. Bureau of Mines statistics shows that during the period from 1922 to 1930, an annual average of 3963 tons of lime was used in sanitation, which includes sewage treatment and garbage disposal. The lowest amount was 1473 tons in 1923 and the highest 9307 tons in 1925.

A portion of this tonnage of lime has undoubtedly been used in controlling the digestion of sewage sludge in separate sludge digestion tanks. In this process, fresh solids which have been separated from the liquid portion of the sewage, are daily added to well ripened sludge maintained in separate tanks, the digestion reactions being accelerated by heat produced from the burning of combustible gases generated during the digestion.

If the pH value is maintained above 7.0, or slightly alkaline, the digestion will usu-

*Paper read at the 14th annual convention of the National Lime Association, Cleveland, Ohio, May 24, 1932.

ally proceed without odors or foaming. However, if there is no ripe sludge for seeding purposes, or fresh solids are fed too rapidly, an acid reaction occurs, with the pH value falling below neutral. Under such conditions it has been found advisable to bring about an alkaline reaction by adding lime.

You will undoubtedly recall my discussion of the lime-chlorine process presented at the convention last year in White Sulphur Springs. As reported, Baltimore, Dayton and other cities have successfully used this improved method for sterilizing sewage effluent, particularly during the summer months. If the 1931 figures were available, they perhaps would show a slight increase in the amount of lime used in sewage treatment because of the adoption of this process.

During the past year, experimental work has been under way in Dayton in an attempt to control the pH value in sludge filtration by adding lime, thereby reducing the amount of ferric chloride required. Recent correspondence with the superintendent of sewage treatment of that city states that the results attained have met with success and will be published at the proper time.

Considerable lime is being used in a direct oxidation or electrolytic process for treating sewage in Winston-Salem, N. C., but in all of these projects the amount involved is comparatively insignificant when compared with the substantial tonnage which undoubtedly will be used following the development and adoption of chemical precipitation methods for handling sewage.

Lime Used in New and More Economical Processes

In these days of curtailed municipal budgets, the attention of city officials and tax payers is being focused very carefully on all proposed expenditures, especially when the bond issues run into the millions of dollars. It is safe to assume, however, that retrenchment programs will have a minimum effect on such municipal functions as police, fire and health. If a city cannot continue such commendable projects as garbage collection, water treatment and sewage disposal, their control will be taken over by private enterprise, the financing of which will be met by fees paid by individual home owners.

Even though there is little chance that sewage treatment plants will be discontinued, those responsible for their economical operation are not adverse to meritorious proposals for reducing this cost through the adoption of new methods, designed to operate successfully using the major portion of equipment already installed. Realizing that this is true and offers an opportunity for new business, a number of industrial and engineering concerns are now turning their serious attention to municipal work. New methods for sewage disposal are being developed, entirely different in character from existing plants. In addition to the anticipated efficiency of the proposed methods, they are especially attractive to cities and towns now contemplating the construction of a sewage treatment plant, from the standpoint of low initial cost and reduced daily operating expense.

Obviously, there will be opposition to any concerted action taken to introduce these radically different types of treatment plants. Sanitary engineers and consulting engineering firms will not be receptive to the new ideas at first because of the fear of losing their professional reputations as authorities in this field. However, just as soon as a few successful plants are in operation, it is quite likely that they will seriously investigate the merits of the method and join with others in advancing a sound proposal introduced primarily because of the economic conditions of the past two years.

Dearborn, Mich., Plant Revolutionary

The City of Dearborn, Mich., now boasting a population of over 50,000, is in its third month of operation of a sewage treatment plant entirely different in design and process from that used elsewhere. Following a consolidation of the former cities of Dearborn, Fordson and a portion of Dearborn Township to form the present City of Dearborn, plans were considered to build an activated-sludge plant requiring forty acres of land, with an estimated cost of $800,000, exclusive of engineering and land.

During a recent visit to Dearborn, I was told by Mark B. Owen, superintendent, Department of Public Works and Engineering, that Henry Ford objected to the expenditure of such a sum of money for the type of sewage plant proposed, but that he would approve an installation requiring less land and less money, and which would at the same time produce effective results without odor, operating under one roof. To comply with these conditions, Mr. Owen inspected and investigated other plants and processes throughout the eastern half of the United States, with the result that in 1930 an experimental sewage tank was built under the combined direction of W. C. Laughlin of the Filtration Equipment Corporation and Mr. Owen, designed to operate by chemical precipitation of the sludge with lime, ferric chloride and paper pulp, followed by chlorination of the effluent.

The results attained encouraged the construction of the present Dearborn plant, all located in one building covering a comparatively small ground area, for which the cost was $455,000, or approximately 50% of the previous estimate. The plant is designed to treat the sewage from about twelve square miles of Dearborn, the sludge from sewage of 33 square miles of Detroit territory and all sludge from the existing Dearborn East Side plant covering another 12 square miles of Dearborn. The present sewage flow is about 2¾ m.g.d., and it is believed the equipment will successfully handle a maximum flow of 8 m.g.d.

Lime a Necessary Chemical

The process is both chemical and mechanical, involving the addition of lime, ferric chloride and paper pulp to the sewage which is then passed through a baffled mixing chamber and into a circular clarifier. Further clarification of the liquid portion of the sewage is then brought about by passing it upward through a 3-in. bed of magnetite, following which it is chlorinated and discharged into the River Rouge. The sludge, containing about 97% water, is pumped to Oliver filters where the moisture is reduced to approximately 60%, after which it is delivered by belt conveyor to bins and the storage pile. Ultimate disposal of this inodorous sludge will be made by incorporating it with the soil on the extensive farm lands operated in that territory by Mr. Ford.

The paper pulp is credited with assisting in the filtration process, and is supplied by the regular city refuse collectors. During the present day-time operation, the lime used is in the form of Prestolite sludge, which is thoroughly mixed with the paper in a pebble mill before being fed to the raw sewage. At night the plant is operated by one man, when Prestolite sludge is discontinued and milk of lime, made from rotary kiln pebble lime, is added to the sewage without previous mixing with paper pulp. According to conditions, an average of 800 lb. of lime is required to treat each million gallons of sewage handled.

The simplicity of this type of plant becomes apparent when contrasted against the complex biological installations throughout the country, with their acres of trickling filters, settling tanks, sludge drying beds and other miscellaneous equipment. When further consideration is given to the difference in cost of building and operating the two systems, it is difficult to forsee any great permanent obstacle to the advancement of the former, provided, of course, that satisfactory results are attained.

Another New Process Uses Lime

Entirely independent of the work in Dearborn, another investigator in the East has arrived at practically the same conclusion regarding sewage treatment processes, with perhaps a more inclusive idea, and certainly one which recommends the use of larger amounts of lime than at Dearborn.

In brief, the scheme proposed is to treat fresh sewage with excess lime in the form of a milk-of-lime suspension, allow the solids to separate from the liquid portion in settling tanks and then sterilize the effluent with chlorine before it passes to the nearby stream or river. The settled sludge is removed from the clarifier, partially dried by heat generated in another part of the plant where a stored supply of city refuse and garbage is burned, and is then itself incinerated in a specially built kiln or oven which permits the recovery of perhaps 50% of the lime, and at the same time solves the

problem of sludge disposal. Part of the sewage effluent is used to hydrate the recovered lime which is in turn reused in the earlier stages of the process.

This type of plant is estimated to cost less than one-half as much to build as present-day biological installations, and daily operating costs are predicted to run about one-third. On the basis of these cost ratios, which I understand have been checked by some of the best estimators in their respective fields, together with the easy burnability of limed sewage sludge and overall simplicity of the process, the plan should almost sell itself. The stumbling blocks are the opposition of sanitary engineers, to which previous reference was made, and the fact that money is not easily obtainable, especially for projects still on paper, however sound they may be in principle.

To put this program across—and now seems to be the logical time to begin—will require carefully prepared publicity in the form of trade journal articles, coupled with personal contacts with open-minded authorities in the sanitation field. Favorable propaganda released by one or more nationally known engineering companies would materially stimulate progress, provided they could be sold on the general idea. Once a plant was built and in successful operation for a short period of time, considerable momentum would be added to the program. Even now, representatives of the Filtration Equipment Corporation are working throughout the East in an endeavor to promote the Laughlin process, similar to that in successful operation in Dearborn.

Potential Market for Lime Enormous

It is difficult to estimate the potential tonnage of lime which may develop from the gradual adoption of the two new treatment methods described. Both use lime to accomplish the same purpose; namely, as a chemical precipitant for the sewage solids. In the Laughlin process, lime is used in connection with ferric chloride and paper pulp; in the other proposed method, an excess quantity of lime alone is expected to do the work.

On the basis of 800 lb. of lime for every million gallons of sewage flow, cities like Baltimore and Dayton handling, in the order named, 60 and 22 m.g.d., would require 24 and 8.8 tons of lime every day. Milwaukee, with a 110 m.g.d. plant would use 44 tons of lime daily; Chicago's North Side plant handling 175 m.g.d. would use 70 tons; New York's proposed Ward's Island 180 m.g.d. plant would consume 72 tons of lime and Chicago's proposed West Side plant at 450 m.g.d. would use 198 tons daily, provided of course that these plants were operated at capacity, which will not be the case at first, as they are designed to take care of future growth in population.

The estimates just given are calculated in accordance with the lime requirements of the Laughlin system, and will be correspondingly greater in any method using only lime as the precipitating agent. To counterbalance this increase, allowance must be made for partial lime recovery in the process which disposes of sewage sludge by incineration. In either case, however, the lime tonnage involved is of sufficient magnitude to warrant the serious attention of our industry.

Were it not for the distressing economic period from which we hope we are now emerging, it is quite certain that a definite program for actively promoting these new types of sewage treatment plants would be recommended for adoption by this convention. On the other hand, the same disturbed financial situation is largely responsible for the development of new thought in this field, and one of the factors which will undoubtedly influence an early adoption of the principles involved.

Talc and Other Nonmetallic Minerals

INFORMATION on talc and other nonmetallic minerals is given by J. B. Aikman, Vermont Talc Co., Chester, Vt., in a recent issue of *The Rose Technic*.

Theoretically talc is a hydrous magnesium silicate, $H_2Mg_3(SiO_3)_4$, consisting of 63.5% silica, 31.7% magnesia and 4.8% water. Practically all talcs, however, contain impurities such as alumina, iron and calcite.

The principal production is from New York, Vermont and California in the order named, but it is also found in Washington, Wisconsin, Virginia, Maryland, New Jersey, Pennsylvania, North Carolina and Georgia. The New York product is whiter but has less slip or soapy feeling than the Vermont talc. Pulverized soapstone, an impure talc produced principally in Virginia, is used to a considerable extent where its impurities are not a disadvantage.

There are three general classes of talc: fibrous, from northern New York; massive or granular, widely distributed and abundant in Vermont; and foliated, such as that from California.

The principal uses of talc are as fillers in the manufacture of paper, rubber, paint and various other products. It is also used to prevent rubber compounds from sticking to hot rolls, for foundry facings, lubricants and in the preparation of some chemicals.

In its natural state talc is comparatively soft but when heated to a red heat it becomes hard enough to scratch glass. Because of this and its very low coefficient of expansion certain talcs have been used to make fittings for switchboards, gas stoves and other equipment subjected to heat.

Normally about 200,000 tons of talc and soapstone with a value of 2½ million dollars are produced annually in this country. In 1930 there were 28 producers.

Pyrophyllite, a hydrous aluminum silicate obtained chiefly from North Carolina, has almost identical physical properties.

Tripoli, an extremely porous light-weight silicate produced in Missouri, Okahoma, Illinois and Tennessee, is used for foundry facings, in washing powders, paints and for filtering.

Bentonite, a highly absorbent, plastic, clay-like matrial, greenish-yellow in color, and found in Wyoming, California and South Dakota, is used in soap making, as a retarder in gypsum plaster and in many small ways.

Fuller's earth, most of which comes from Florida, Georgia and Texas, is used to absorb colors from oils.

Preparation of Gritless Milk of Lime

IMPROVED equipment for the preparation of milk of lime from lump lime is described by E. Storch in a recent issue of *Engineering Progress*. By this method the slaking and dissolving is speeded up by mechanical means and any insolubles or undissolved particles are separated from the liquid.

In the intermittent process the required amount of lime is placed in a stationary basket within a rotating container and the necessary water added. The rotation of the container (about a vertical axis) circulates the water through the basket, which is arranged with openings, and rapidly dissolves the lime. The liquid is then drawn off and passed through a centrifugal strainer equipped with a screen, while any coarse impurities remaining in the basket are removed periodically.

In the continuous process the lump lime is fed to an inner basket and water admitted continuously through holes in a central vertical pipe. The basket and the container surrounding it are both stationary, but a rotor below the basket keeps the liquid in circulation through slots in the basket. The liquid in the annular space between the basket and the container overflows at the top to a centrifugal strainer as in the other process. Since the liquid rises slowly in this space, any undissolved particles sink and are again circulated by the rotor.

Effects of Lime on Southern Iowa Soils

SOME CHEMICAL and Bacteriological Effects of Various Kinds and Amounts of Lime on Certain Southern Iowa Soils is the title of Bulletin 148 recently issued by the Agricultural Experiment Station, Iowa State College, Ames, Ia. The report is based on laboratory and greenhouse experiments, giving first a historical review and then a detailed report of the experimental investigations. A bibliography is also given on this subject. In the summary it is stated that between 3 and 4 tons of pure calcium carbonate is required to bring the reaction of the Grundy county silt loam up to pH 7.0 in 3 months, while quarry-run limestone, with a 9-ton application, raised the pH to 6.65 in the same time. A very detailed summary of the tests is given.

Grinding Plant Research*

Part VI—Grinding Tests on Coal and Clinker in Tube Mills and on Standard Sand in Experimental Mill

By William Gilbert
Wh.Sc., M. Inst. C. E., London, England

AFTER MAKING a number of tests at various plants it was realized that the results were not readily comparable, since the mills operated under variable conditions as to diameter, speed, size and type of grinding bodies, fineness of grinding, hardness of material ground, and the quantity of material mixed with the grinding bodies.

In kominors and tube bills, moreover, it was usual to find the discharge ports hammered over by the action of the grinding bodies, or partly choked with pieces of iron or broken flint, so that the quantity of material retained in similar mills would vary considerably. Further, it was often difficult to obtain permission to stop the mills for the purpose of weighing the grinding bodies and the material retained in each compartment.

Report to Research Committee

For the above reasons the writer concluded that a considerable part of the desired information could be best obtained from an experimental tube mill installed in a suitable laboratory. A report was therefore drawn up and submitted to the research committee, suggesting that a small tube mill be installed as the best method of completing the investigation of the following matters:

(1) To what extent should the grinding be performed by large balls, or by smaller balls, flint stones, cylpebs or holpebs, the result so far obtained appearing to show that the proper size and subdivision of the grinding bodies is of great importance.
(2) The best speed, in relation to the diameter, for a ball or tube mill.
(3) What proportion of the mill volume should be occupied by the grinding bodies.
(4) What effect the quantity of material retained in the mill has on the grinding efficiency.
(5) The relative effect on the grinding efficiency of smooth steel lining plates and corrugated lining plates.
(6) To what extent the diameter of the mill affects the size of the grinding bodies which should be used in it.
(7) To what extent the output of a grinding mill is affected by the hardness of the clinker.

It was proposed to use a mill 48 in. in diameter and 48 in. long, which would not require a feeder or inlet and outlet orifices, a definite charge of grinding bodies and material being put into the mill through an opening in the periphery. The mill would then be operated for a given time. For instance, suppose 5 cwt.† of material are put into the mill, which is then rotated for 15 minutes, after which it is assumed that the material is ground to a residue of 5% on 180 mesh. The equivalent output of the mill, if used as a continuous grinder, would be $\frac{60}{15} \times 5 = 20$ cwt.† per hour, to the same residue on the 180-mesh sieve.

By making systematic tests in that way with steel balls of 4-in., 3-in., 2-in and 1-in. diameter, also with flint stones and cylpebs, it would be seen by comparing results for what range of reduction each size or type of grinding body is most suitable. For example, the information obtained could be used to determine the correct capacity of the preliminary mill, in relation to the finishing mill, for clinker and coal grinding.

The experimental mill could be used to compare the relative hardness of the rotary clinker at the various plants before and after storage. A definite quantity would be put into the mill, together with a standard charge of steel balls, and after operating the mill for a suitable period, say ¼ hour, sieve tests would be made of the ground product.

A 40% charge of steel balls for the proposed mill would weigh 2½ tons. If the voids between the grinding bodies were completely filled it would hold 7 cwt.† of clinker grit. The maximum power required, at a speed of 29 r.p.m., would be 26 hp. The mill would be driven by a direct current electric motor, so that the horsepower used in any experiment could be conveniently measured.

Since the effect of a grinding body depends to a considerable extent on the diameter of the mill, it was proposed to fix a tube, 5½ ft. in diameter and 4 ft. long, on the same bedplate, in order to make comparative tests. Such a mill would carry a charge of 4¾ tons of steel balls and require 57 hp.

The use of a tube mill of normal proportions (for instance, 48-in. diameter and 16 ft. long) had been proposed, but it was considered that the grinding action in a short tube mill with closed outlets was representative of the grinding action in a longer mill with a continuous feed.

This report caused rather a heated discussion, two members insisting that the grinding action in a short tube mill with closed outlets would not be representative of the continuous grinding action of a normal tube mill, and therefore that the proposed experimental mill would not furnish the information required. As a result, permission to build a 48-in. by 48-in. experimental mill was not obtained.

It occurred to the writer, however, that the matter might be tried out on a tube mill which was being used, in conjunction with a kominor, for coal grinding at the Harefield Works. The tube mill had a flint stone chamber 51¾ in. in diameter and 15 ft. long, which carried a charge of 3¼ tons of flints.

Two experiments were made, the mill being first tested under normal operating conditions and then with closed outlets.

Tube Mill Test on Coal Grinding

Experiment No. 1—with Continuous Feed. The mill was started up under ordinary conditions and a steady feed at the rate of 1½ tons per hour was put through the kominor and the tube mill for 100 minutes. Samples of the coal entering and leaving the tube mill were taken every 20 minutes, and at the end of the experiment the tube mill was opened up and a sample of the ground coal was taken from the center of the length of the mill. The sieve test results were:

	Residue on 180 mesh
Entering tube mill (average)	82.6%
At center of mill	32.0%
Leaving tube mill (average)	11.8%

The above results are plotted as an axial sieve test in Fig. 31, the points being on the upper curve, which is shown dotted. At the conclusion of the experiment the flint stones and the coal were emptied out of the mill. The coal was weighed and found to be 665 lb., or 7 lb. short of 6 cwt.†

Experiment No. 2—with Closed Outlets. Before replacing the flints the outlets of the tube mill were blocked up and 6 cwt.† of coal, which had been ground through the kominor at the same rate as for Experiment No. 1, were put into the mill through the manhole door. The kominor was then disconnected from the tube mill.

It was considered that since the tube mill in the first experiment ground 30 cwt.† per hour, or ½ cwt.† per minute, the charge of 6 cwt.† which was put into the mill for the purpose of the second experiment should be ground to the same degree of fineness in 12 minutes. The mill was accordingly rotated for 12 minutes. On removing the manhole cover and taking samples from the interior, the fineness of grinding was found to be practically the same as before. It should be mentioned that a sample was also taken from the interior, after the mill had been running for 6 minutes, and the experiment was con-

*Copyright by author. All rights reserved.
†112 lb., based on English ton of 2240 lb.

tinued for 19 minutes in all. The sieve test results were:

	Residue on 180 mesh
Coal as put into mill	78.6%
After grinding 6 min.	30.0%
After grinding 12 min.	11.4%
After grinding 19 min.	4.0%

The lower curve in Fig. 31 represents the intermittent test. It will be seen that the coal put into the mill was somewhat more finely ground than before. The fineness of grinding of the sample taken at the center of the mill for the continuous test should be the same as that taken after 6 minutes on the intermittent test and the third line of Experiment No. 1 should compare with the third line of Experiment No. 2. It will be seen that the agreement was very close, the residue being 11.8% in the first test and 11.4% in the second test.

The experiment also showed the capacity of the tube mill for fine grinding, since after 19 minutes the residue on 180 mesh was only 4%.

It will be noted that had the intermittent grinding been continued for one hour the resulting product would be the same as that produced by a tube mill of the ordinary type of a length of 75 ft. It is thus seen how convenient the proposed mill would be when investigating problems relating to fineness of grinding.

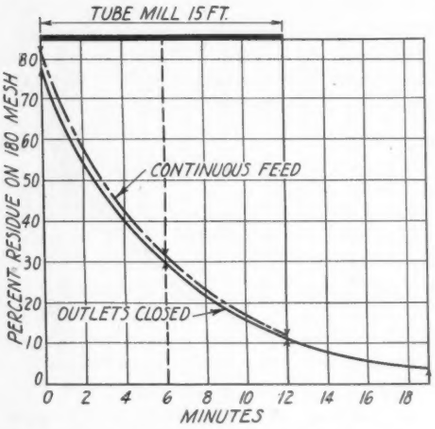


Fig. 31. Comparison of results on coal grinding with continuous feed and with intermittent operation, outlets closed

The result of the experiment was reported to the research committee, but the two members who had previously opposed the installation of an experimental tube mill still held that, although the grinding action in the two cases was apparently the same in the case of coal, it might not be the same when dealing with clinker. Therefore further experiments were made at the same plant on clinker, using a kominor and a tube mill. The tube mill consisted of a flint stone chamber and a cylpeb chamber. The first chamber had a diameter inside the lining of 53⅛ in. and a length of 15 ft. The cylpeb chamber was not required and the cylpebs were removed.

Ten tons of grit, suitable for the tube mill, were prepared by passing the clinker at a regular rate through the kominor only. The grit was made up into bags of 1 cwt.,† a small sample being taken from each bag for sieve analysis. The material was found to be reasonably uniform in size, the average residue on 180 mesh being 61%.

Tube Mill Test on Clinker Grinding

Experiment No. 3—with Continuous Feed. The kominor being disconnected, the bags of clinker grit were fed to the tube mill uniformly at the rate of 1 per minute, or 3 tons per hour. Eight tons in all were used, so that the trial lasted 2⅔ hours.

Previous to the experiment the mill had been partly emptied of material, and some little time had to elapse before the conditions became uniform. Samples were taken from the mill delivery at equal intervals of time, the result being as shown below:

Time	Residue on 180 mesh	Remarks
3.30	9.8%	Mill with continuous feed
4.0	12.9%	Sieve tests on half
4.30	18.1%	Hourly samples
5.0	18.7%	
5.30	18.3%	

The average residue of 18.4% is taken on the last three samples only. At the end of the run an axial sieve test was made, samples being taken close to each end plate and in three intermediate positions. The mill was then emptied and found to contain 4.64 tons of flint stones and 1.38 tons of material.

Experiment No. 4—with Closed Outlets. The diaphragm plate between the flint stone chamber and the cylpeb chamber was boarded up.

Since the mill in Experiment No. 3 held 1.38 tons of material (when grinding at the rate of 3 tons per hour) the flint stones were put back into the tube together with 1.38 tons of the kominor grit which had previously been bagged up. In Experiment No. 3 the mill ground at the rate of 3 tons per hour, and it was considered that the grit should be ground to the same degree of fineness in the second experiment, if the mill was rotated for

$$\frac{1.38}{3.00} \times 60 = 27.54 \text{ minutes}$$

The mill was accordingly operated for this length of time, but in four equal stages, stops being made at the end of each stage to obtain samples. The results are shown in the table below, those for Experiment No. 3 being the sieve tests taken inside the mill at the end of the experiment and those for Experiment No. 4 being the sieve tests made at the end of four equal intervals. It will be seen that there is a close agreement.

SCREEN TESTS ON CLINKER

Experiment No. 3 (Axial sieve test)		Experiment No. 4 (Periodic samples)	
Distance along tube	Residue on 180 mesh	Time interval	Residue on 180 mesh
Feed end	61.2%	At start	61.0%
¼ distance	50.9%	¼ interval	50.4%
½ distance	37.8%	½ interval	34.9%
¾ distance	25.1%	¾ interval	27.6%
Delivery end	19.2%	At finish	20.0%

The mill with closed outlets was operated for a second period of 27.54 minutes, the final result being a residue of 3.6% on 180 mesh. In all cases sieve tests were made on the 100-mesh and the 76-mesh sieves, and the results confirmed the tests made with the 180-mesh sieve.

The results are also shown in Fig. 32, the solid circles denoting the experiment with continuous feed and the hollow circles the experiment with closed outlets.

It will be seen that either group of points may be represented by the same curve, hence the experiments made with clinker completely confirmed the parallel experiments on coal. It was shown beyond all doubt that the grinding action in a mill with closed outlets is completely representative of the grinding action when the feed is continuous.

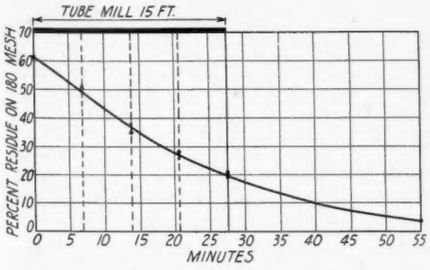


Fig. 32. Clinker grinding results, continuous feed and intermittent operation with closed outlets

Attention is drawn to the general shape of the curves in Figs. 31 and 32. On comparing them with a curve obtained by grinding standard sand it will be found that the coal ground more easily in the early stages. The clinker curve is generally similar to the sand curve throughout. The class of coal and the method of drying it apparently may influence the result considerably.

These further results were reported to the research committee, but the project for the installation of an experimental mill met with the same opposition as before. At this point the chairman ruled that for the time being the research staff should concentrate on reducing the coal consumption of the rotary kilns, which was a serious item. Accordingly, the next four years were mainly spent in this manner, and it was finally demonstrated in practice how the standard coal consumption of any wet process kiln could be reduced from 33% (the prevailing figure) to 26%.

When the rotary kiln investigation was nearly complete the joint research committee of the Associated and the British Portland Cement Manufacturers was merged into the British Portland Cement Research Association. A. C. Davis was appointed chairman and the writer became the first director of research. Two new members representing firms not previously included were added, and one of them, Charles E. Blyth, was much interested in grinding problems.

At the suggestion of Mr. Davis and Mr. Blyth the writer prepared a design for a

small tube mill with closed outlets, the size being 18 in. in diameter by 18 in. long inside the lining. It was considered that a very large number of experiments would have to be made in order to clear up the points already mentioned and that most of them could be more easily and quickly done with a mill of this size than with a larger one.

When the experiments on the small mill were complete it was suggested that the larger mill should be installed, in order to try out the effect of diameter. The research association council agreed to this program and the 18-in. by 18-in. mill was accordingly built. Mr. Blyth proposed that all the grinding experiments should be made with Leighton Buzzard standard sand, this being (as far as was known) a material of uniform hardness. It proved to be a valuable suggestion.

18-in. Experimental Mill

The 18-in. by 18-in. mill ultimately became well known, since it was used for all the small scale experiments made by the writer on fine grinding, to be shortly described, and subsequently it passed under the control of Dr. Martin, who used it throughout his experiments on the microscopic measurement of the particle size.

Fig. 34 shows a cross section of the mill which was belt driven through a countershaft and gears. The grinding bodies and the materials to be ground were put into the mill through a 7-in. diam. opening on the side. The lining plates used for the early experiments were provided with lifter bars as indicated. This was due to the excellent results from the coal grinding tube mill at I. C. Johnson's Works, which was fitted with lifter bars. A spare set of lining plates without lifter bars was also frequently used. The grinding bodies shown in Fig. 34 are 1-in. diam. steel balls, to scale.

The mill revolutions were recorded by a counter, which was driven by a connecting rod from the main shaft, and in addition a tachometer indicated on a dial the r.p.m. of the mill at any instant. The mill was belt driven by a 2½-hp. motor with a suitable range of speed variation. The horsepower required to drive the mill, with various charges of grinding bodies and at different speeds, was worked out from the ammeter and voltmeter readings, by the method already described.

The average diameter inside the lining plates was found to be 17.85 in. and the length 18 in. The mill volume inside the lining, deducting the space occupied by the lifter bars, was 4422 cu. in.

The grinding bodies used in the first series of experiments were hard steel balls, 1 in. in diameter, which were purchased from a manufacturer of ball bearings at a reasonable cost, as defectives. The balls were, however, exactly 1 in. in diameter, perfectly spherical, and roughly polished. Each ball weighed 2.35 oz. Dry standard sand, lightly shaken in a box of 1 cu. ft. capacity, was found to weigh 93.8 lb.

Ratio of Material Volume to Void Volume

The object of the first series of experiments was to find out to what extent the voids between the grinding bodies, when the mill is at rest, should be filled up by the material to be ground. The ratio of the material volume to the void volume is termed the M.V. ratio.

It was decided to use in the first instance a charge of 300 lb. of the 1-in. balls, which were put into the mill and the surface leveled. Water was then poured in, from a large measuring glass, until the surface of the water coincided with the average surface of the charge, the quantity of water used being 780 cu. in. The charge surface was

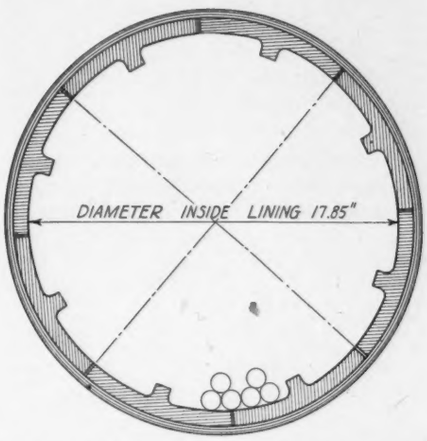


Fig. 34. Cross section of 18-in. by 18-in. experimental tube mill

found to be 1.3 in. below the center line of the mill.

From a table of segment areas, or from the graph, Fig. 2, Part I, the charge volume is found to be 40.7% of the mill volume, so that the volume of the charge is

$$0.407 \times 4422 = 1800 \text{ cu. in.}$$

The ratio of the void volume to the charge volume is $\frac{780 \times 100}{1800} = 43.3\%$.

Test No. 1—Ratio of Sand to Voids, 115%. The volume of the voids being 780 cu. in., the volume of the sand required is $1.15 \times 780 = 897$ cu. in. It was preferable to estimate sand quantities by weight, hence the weight required was $\frac{897}{1728} \times 93.8 = 48.7$ lb.

After drying out the mill the charge of 300 lb. of 1-in. steel balls was replaced, together with 48.7 lb. of standard sand. The sand had previously been redried, passed through a 20-mesh sieve and retained on a 30-mesh sieve.

For liner plates provided with lifter bars it was decided to use a speed factor, Sf, of 193 (see Part 1). The required r.p.m. is therefore

$$N = \frac{Sf}{\sqrt{D-d}} = \frac{193}{\sqrt{17.85-1}} = 47.0$$

The mill was rotated for 150 revolutions at 47 r.p.m. and was then opened up and a sample taken for sieve tests, with the result shown on line 1 of Table V. The sample was subsequently returned to the mill, the door was replaced, and a further run of 150 revolutions made. Later on, as will be seen from the table, runs of 300 revolutions were used. On plotting to an enlarged scale from the last three lines of the table, the total mill revolutions against the residue on 180 mesh, it was found that 4100 revolutions were required to reduce the residue to 5%.

The figures in Table V, which connect the mill revolutions with the residues on 180 mesh, are plotted in Fig. 35. In many of the experiments to be described it is found convenient to take the number of mill revolutions required to grind to a residue of 5% on 180 mesh as 100, so that when plotting each sieve residue the actual mill revolutions are suitably reduced. For instance, it will be seen from Table V that 1500 mill revolutions were required to grind the sand to a residue of 48.1% on 180 mesh, so that on the graph, Fig. 35, the corresponding revolutions percent will be $\frac{1500}{4100} \times 100 = 36.6\%$. This is the point marked "A" on the graph.

TABLE V. TEST No. 1

Ratio of Sand to Voids, 115%
Mill average r.p.m. = 47

Total mill revolutions	Sieve residues, percent				
	180 mesh	100 mesh	76 mesh	50 mesh	30 mesh
150	92.8	86.5	81.7	70.5	45.9
300	88.8	79.7	73.5	59.8	25.1
450	87.5	78.2	70.4	53.6	22.9
600	80.6	66.9	57.6	39.7	14.2
750	72.6	58.5	47.6	29.2	8.5
900	68.6	52.0	41.6	23.1	5.1
1050	62.8	46.1	34.2	15.5	2.1
1200	58.8	40 0	27.2	10.0	0.9
1350	52.2	33.7	19.7	5.4	0.3
1500	48.1	27.2	14.4	2.9	....
1650	43.8	21.2	10.9	1.6	....
1950	36.8	14.0	4.7	0.4	....
2250	28.0	8.0	1.9	....	....
2550	21.5	4.2	0.6	....	....
2850	16.6	2.4	....	....	....
3150	13.3	1.4	....	....	....
3450	9.9	0.9	....	....	....
3750	7.3	0.4	....	....	....
4050	5.3	....	....	....	....
4350	3.7	....	....	....	....

Working out the test, the charge of sand in the mill was 48.7 lb., and since the mill made 47 r.p.m., if operated continuously it would make $60 \times 47 = 2820$ revolutions per hour.

Since 4100 revolutions were required to grind 48.7 lb. of sand to a residue of 5% on 180 mesh, it follows that the output per hour to this residue is, $\frac{2820}{4100} \times 48.7 = 33.6$ lb.

The average power supplied during the test was 0.85 hp., hence the horsepower per ton ground per hour is $\frac{2240}{33.6} \times 0.85 = 56.6$ hp.

(To be continued)

Developments in Material Specifications

Annual Meeting American Society for Testing Materials

By P. J. Freeman
Consulting Engineer, Pittsburgh Testing Laboratory, Pittsburgh, Penn.

THE 35th annual meeting of the American Society for Testing Materials, at Atlantic City, N. J., June 20 to 24, showed a registered attendance of approximately two-thirds the number attending the meeting last year. Although this decrease in attendance was noticeable in the general sessions, the work of the committees appeared to be progressing very satisfactorily. To the writer this emphasizes the importance of committee work in Society activities and shows that the supporters of the Society appreciate the necessity for having representatives in attendance at committee meetings. The activities of the committees overshadowed the general sessions, and in some committee meetings the attendance was larger than at the general session at which committee reports were presented.

New President Well Known to Rock Products Producers

The president of the Society for the coming year will be Cloyd M. Chapman, who is well known to the producers and users of concrete and concrete materials. Mr. Chapman has been a contributor to the literature of concrete for many years and has been active in the work of various national engineering societies. During his chairmanship of Committee C-9 on Concrete and Concrete Aggregates, that committee has shown unusual activity and progress, and without doubt the new president will show similar results for his efforts in the activities of the Society as a whole.

Report of Cement Committee

Committee C-1 on Cement, P. H. Bates, chairman, reported extensive changes and revisions of the Standard Methods of Testing Cement, C77-30, and a revision of the Manual of Cement Testing. These revisions of the Methods of Testing and the Manual were recommended for immediate adoption and are being sent out for letter ballot of the Society. No changes were made in the specification requirements for cement, which are covered by a separate specification, but numerous changes and additions have been made in connection with the methods of sampling and testing cement and in the requirements for the equipment used in the cement laboratory. It will be necessary for those interested in the methods of sampling and testing cement to carefully study the new requirements, some of which are as follows:

Samples shall be shipped and stored in moisture-proof air-tight containers. Hitherto this has been a recommendation but not a specific requirement.

The quantities of dry materials permissible in one batch has been raised to 1200 grams for mortar mixtures. Detailed requirements have been added for the time of turning the dry materials into the water and the interval for absorption. The time of actual mixing has been increased to one-and-one-half minutes, making an increase in total time of one-half minute per batch.

The requirements for the temperature of the room have been fixed between the limits of 68 deg. and 81½ deg. F. The temperature of the mixing water, moist closet and water in the briquette storage tank has been reduced from + or — 5 deg. F. to + or — 3 deg. F. from 70 deg. F.

The new methods require that the pats for soundness shall be examined within one hour after removal from the steam apparatus.

The specifications for briquette molds formerly contained a very strict requirement for the thickness of the mold. This requirement has been removed for old molds and now applies only to new molds. This change was brought about by the fact that the previous specifications caused the rejection of a large number of valuable molds on account of a requirement which was unnecessarily severe, as the thickness of the briquette is controlled more by the method of troweling than by the actual thickness of the brass mold.

Temperatures of Cement at Time of Use

The question of whether the temperature of cement at time of use affects the properties of resulting concrete has been raised chiefly by highway engineers; and a number of highway departments have instituted requirements limiting the temperature of cement. A subcommittee has been studying this problem for about two years and the results of its findings are included in the report of Committee C-1. The several reports seem to present two opposite viewpoints, and the general conclusions emphasize the need for those interested in the purchase of cement to study all conditions which tend to produce hot concrete.

The report gives a digest of investigations made by various highway departments and others, together with a short bibliography of the subject. It seems doubtful if the report of this subcommittee will entirely satisfy all highway engineers, but the data studied by the committee seem to warrant the following conclusions:

1. The temperature of freshly mixed concrete rather than the temperatures of the separate ingredients appears to be the factor which influences the properties of the concrete.

2. The temperature of freshly mixed concrete depends upon the temperatures, specific heats and weights of all of the materials entering into the concrete.

3. Increasing the temperature of freshly mixed concrete decreases the slump and flow.

4. Increasing the temperature of cement paste accelerates its rate of setting.

5. There appears to be little effect on strength until the temperature of the freshly mixed concrete is well above 100 deg. F. At 130 and 165 deg. F. the one-day strength was increased, but at later periods the strength was decreased; the compressive strength was more affected than the modulus of rupture. The decrease in strength at the higher temperatures appears to be due in part to the additional water required to maintain a given consistency.

6. On account of the low specific heat of portland cement and of its relatively small quantity in the usual mix, the temperature at the time of use of portland cement of normal properties appears to be a minor factor in producing high temperatures of freshly mixed concrete under usual job conditions.

7. The temperature at the time of use of portland cement of normal properties was unimportant under job conditions covered by this report.

Cement Reference Laboratory

The inspectors of the Cement Reference Laboratory have found in their discussions with the staffs of various laboratories that the Manual of Cement Testing which has been in use for some time should be more explicit and it was largely through the suggestions of the staff of the Cement Laboratory that the committee had largely rewritten the Manual. J. R. Dwyer, technical assistant of the committee, has been making contacts with other organizations and some engineers who he has learned are promulgating standards different from those of the Society. In a general way Mr. Dwyer has continued to direct the activities of the Cement Reference Laboratory and also call attention of the various subcommittees to the

fact that he has been accumulating information from various sources which is of value to such subcommittees.

For those who may have forgotten about the establishment of the Cement Reference Laboratory it will be stated that the 70th Congress appropriated $12,500 for the U. S. Bureau of Standards to establish a Reference Laboratory Plan, and the Portland Cement Association had previously appropriated a similar amount to match the Government appropriation. The Portland Cement Association working through the cooperation of Committee C-1 and the American Society for Testing Materials is benefited by the improvement in methods of testing not only in the laboratories at the mills but in the various commercial laboratories throughout the country. The representatives from the Cement Reference Laboratory inspect equipment and methods of testing in cement laboratories when specifically requested to do so.

The work of this organization has been considerably extended by the ruling of the U. S. Bureau of Public Roads, which was enforced early this year, that no laboratory would be approved for testing cement in Federal Aid work until it has first been inspected by the Cement Reference Laboratory and a report furnished to the U. S. Bureau of Public Roads. Using this report as a basis an official in the Bureau of Public Roads approves or disapproves the laboratory for Federal Aid work. At this time it seems probable that other Federal agencies such as the Engineer Offices in charge of river and harbor construction will utilize the work of the Cement Reference Laboratory in a similar capacity. In connection with the approval of laboratores for use in government work the reports from the Cement Reference Laboratory are mailed directly to the Federal officer who is responsible for the final approval of the laboratory, and reports are not passed through the hands of the testing laboratory, although such laboratory receives a copy of the report. The requirements of the Bureau of Public Roads have added to the duties of the Cement Reference Laboratory and the number of pieces of equipment inspected has increased very greatly during the past year.

Masonry Cement

Subcommittee D on Masonry Cement has prepared proposed Tentative Specifications and Tests for Masonry Cement which will carry the designation C91-32T.

The number of producers of such cement is increasing very rapidly and at the present time approximately 40 mills are making what is called masonry cement. Quite recently a separate Standing Committee, C-12, on Mortars for Unit Masonry was established by the Society, but up to this time no specifications have been issued by Committee C-12 and the work of subcommittee D represents the latest results of committee activity in connection with masonry cement.

Withdrawal of Tentative Standards for Cement

For the past 16 years the Society has had a Tentative Specification, C9-16T, for Compressive Strength of Portland Cement Mortars. For various reasons Committee C-1 has not seen fit to make this specification a standard, and now the committee has withdrawn this specification subject to letter ballot of the Society. In itself the withdrawal of this specification has no effect on the requirements for cement, as it has had practically no use as a cement specification. On the other hand, the methods of making and molding 2x4-in. mortar cylinders as outlined in this specification has been used very generally throughout the country in testing laboratories for the preparation of compression specimens for the determination of the value of a sand for use in concrete in comparison with standard Ottawa sand mortar made under the methods covered by this specification. The withdrawal of Tentative Specification C9-16T for the present eliminates all reference to compressive strength tests as a measure of the quality of portland cement.

Subcommittees are working on the preparation of another specification and the use of 2-in. cubes in place of 2x4-in. cylinders is being favored by a great many committee members as being more satisfactory from the laboratory standpoint than cylinders. A compressive strength specification for portland cement is desired because it is felt that compressive strength more nearly indicates the concrete-making property of cement than the tensile strength obtained from briquettes, but up to this time sufficient data have not been advanced to warrant the committee in changing from the briquette test.

Concrete and Concrete Aggregates

Committee C-9, Cloyd M. Chapman, chairman, reported changes in the following standards to be published as tentative revisions: Standard Method for Making and Storing Compression Test Specimens of Concrete in the Field C31-31; Standard Methods of Making Compression Tests of Concrete C39-27.

The changes in these specifications simply clarify and unify the method. Under the old specifications it was possible to mold a 6x12-in. cylinder in either three or four layers and by puddling it either 75 or 100 times.

With some materials a difference of 25 roddings might materially affect the test results obtained on concrete specimens made from material which has not been previously thoroughly mixed. The specification as changed now requires the concrete to be placed in the mold in three layers, each approximately one-third the volume of the mold, and each layer rodded 25 strokes, making the total 75 per specimen.

A change was made in the Standard Method for Testing Organic Impurities in Sands for Concrete, C40-27, which now permits the use of a color chart as approved by the Association of State Highway Officials and as first proposed in the A. S. T. M. in 1919.

When the withdrawal of Tentative Specification C9-16T for Compressive Strength of Portland Cement Mortar has become effective, attention will be directed to Tentative Method for Test for Structural Strength of Fine Aggregate Using Constant Water-Cement Ratio Mortar, C-87-31T. Engineers and architects who have been accustomed to certain Ottawa sand ratios for mortar strengths of sand to be used in concrete should definitely instruct laboratories performing their work as to whether or not the mortar specimens shall be molded in accordance with this specification, which requires a flow table, or the old method, which has been withdrawn by Committee C-1. Committee C-9 recommended certain changes in this specification to avoid confusion; but the changes do not in any way affect the specification as a whole. The specification now calls for cement and water in quantities which will give a water-cement ratio of 0.6 by weight in place of 0.9 by volume, and in addition prescribes that the sand shall be "saturated and surface dried." It is felt by the committee that some of the inaccuracies in results of this test have come from failure to take account properly of the water absorbed in the aggregate, and therefore the specification now calls for saturated sand, but it must be surface dried.

Soundness of Aggregates

A number of highway departments are requiring sodium sulphate soundness tests on fine aggregate, and a revision of Tentative Method of Tests for Soundness of Fine Aggregate by Use of Sodium Sulphate, C38-31T, makes certain revisions in the method of performing this test, and a new section is added which standardizes the method of recording the test data, which will be of considerable assistance to engineers called upon to interpret the results of such tests.

A similar form for recording test data in connection with tests of coarse aggregate has also been included in the Tentative Specification C39-31T.

Freezing and Thawing Tests

Committee C-9 includes in the appendix of the report a Proposed Method for Testing Concrete and Concrete Aggregates by Freezing and Thawing. This work was prepared by Scholer and Stoddard and represents the latest information available as to methods and equipment used in making freezing and thawing tests by means of a mechanical refrigerator. From several years' experience the authors point out a number of pitfalls which should be avoided by the testing engineer in the development of such freezing and thawing tests.

Road and Paving Materials

Committee D-4, P. J. Freeman, chairman, proposed a new Tentative Method of Chemical Analysis of Calcium Chloride which was adopted for submission to letter ballot of the

Society. This method is suitable for testing calcium chloride for use as an admixture in concrete, for dust laying, or for use in snow and ice removal, and represents about four years' work of the subcommittee.

Tests for Consistency Changed

Tentative Method of Tests for Consistency of Portland Cement Concrete, D38-26T, was changed in order to harmonize the specification with the methods of tests proposed by Committee C-9. In accordance with the changes which were accepted for letter ballot, the mold for making the slump tests shall be filled in three layers, each approximately one-third the volume of the mold, and each layer shall be rodded 25 times, making a total of 75 strokes, which will conform with the method used for making 6x12-in. cylinders.

A number of definitions for the terms "Asphalt," "Flux," "Tar," and "Pitch" were advanced from tentative to standard definitions. In view of the activity of certain manufacturers of these products during the past year, objection was raised to some of these definitions, but in spite of these objections the vote of the session recommended that they be advanced to standard, and as such they will be submitted to letter ballot of the Society. Those interested in the use of bituminous materials may well follow the outcome of the results of the letter ballot and also anticipate considerable change in the specification requirement of the American Society for Testing Materials covering these materials on account of recent important developments in the bituminous industry. An appendix of the report includes Proposed Methods for Testing Sheet Asphalt Paving Mixtures, which briefly describe four methods which are now being used for that purpose.

Lime

Committee C-7 on Lime, H. C. Berry, chairman, reported that Tentative Specifications for Sand for Use in Lime Plaster, C66-31T, is ready to be advanced to standard, but in order to avoid the expense of reprinting the specification at this time the committee will withhold the advancement to standard for another year, when this specification may be published in the 1933 Book of Standards.

The committee announced the approval of a further change in Standard Specification for Hydrated Lime for Structural Purposes, C6-31, with reference to the soundness of lime, which will read as follows:

"If the steam has no visible effect on the pat the sample shall be reported as being 'sound.' If the pat either disintegrates or pops, the sample shall be reported as 'unsound' and the consignment rejected."

This change was made in order to strengthen the requirements and eliminate uncertainty as to interpretation of the specifications.

Sub-Committee on Hydraulic Lime Formed

Committee C-7 announced the formation of a new subcommittee X on Hydraulic Lime, with W. E. Carson, president of the Riverton Lime Co., as chairman. Hydraulic lime has been used extensively in Europe and is being introduced into this country, and for that reason it was felt that a new subcommittee should be appointed whose duties would be to make a special study of this material and prepare specification for its use.

Gypsum

Committee C-11 on Gypsum recommended changes in Standard Specification for Gypsum Partition Tile or Block, C52-27. In view of the fact that the compressive strength is appreciably reduced by a small percentage of free water in the tile the specifications are revised to include a maximum humidity condition.

Changes in paragraph (b) of Section 13 of the Standard Specification were as follows:

"The test specimens shall be dried at a temperature of not less than 21.1 deg. C. (70 deg. F.) nor more than 37.8 deg. C. (100 deg. F.) in an atmosphere of not more than 50% relative humidity. The specimen shall be weighed at one-day intervals until constant weight is obtained."

Paragraph (c) is changed to conform with the requirements brought about in paragraph (b) of Section 13 of the Specification.

Section 14, dealing with methods of testing to determine the Modulus of Rupture of Gypsum Tile or Block, is to be eliminated from the specifications.

Mixing Water for Testing Gypsum

The recommendation of the committee is that in order to clarify the various specifications and make certain that ordinary city water would not be used for testing gypsum plaster, the following note is to be added to specifications C28-30, C59-30 and C60-30:

"The water used for making gypsum plaster shall be clean and free from excessive amounts of mineral and organic substances. Distilled water shall be used for conducting all tests."

The committee further recommends that Standard Methods of Testing Gypsum and Gypsum Products, C26-30, be revised and announces that these revisions have been incorporated in proposed Tentative Methods of Testing Gypsum and Gypsum Products, which will supersede the older specification when it has passed through the necessary stages. The committee reported that these important changes in testing methods were proposed only after a series of tests had been conducted which demonstrated the advisability of making the changes.

Measurement of Particle Size of Cement

Of interest to producers of cement and other materials consisting of very fine powders is the paper by P. S. Roller, of the U. S. Bureau of Mines, on "Measurement of Particle Size with an Accurate Air Analyzer."

A number of improvements have been made in apparatus for determining particle size distribution of fine powder, and this paper discusses the methods used by the author and others for that purpose. Unusual attention is being directed at this time to the determination of particle size in the production of portland cement. Most of the cement produced is very much finer than the openings in a 200-mesh sieve, and for that reason various methods are being used to determine the percentage of very fine material.

The ordinary user of cement will be interested in the claims of some manufacturers of portland cement that the very fine particles are all tricalcium silicate, due to the fact that those portions of the cement containing this material are softer than the coarser particles which contain dicalcium silicate. In order to study these conditions it will be necessary for the cement chemist to separate the cement into various sizes, and we may expect considerable increase in the activity of cement producers and others in the study of these problems.

Volume Change of Concrete

A paper on the "Volume Changes of Early Strength Concrete," by E. R. Dawley, was presented before the meeting by Prof. C. H. Scholer of the Kansas State College. The investigation covers a study of the changes in length of concrete specimens as affected by temperature changes and moisture content.

The paper states that the investigation required the taking of about 600 pages of data. The author has endeavored to draw conclusions and the paper contains a considerable number of tables and curves which cover some of the original data and make it available for further study.

One of the conclusions is of particular interest in that it points out the fact that the coefficient of thermal expansion proved to be more affected by the kind of coarse aggregate used than by the kind or amount of cement. This is something which should be borne in mind by the investigators who are using composition materials such as gravel in making studies of the volume changes in concrete.

The conclusions complete are as follows:

"The early-strength cement produced more workable, stronger concrete with less mixing water than the ordinary portland cement.

"The 3-day compressive strength of concrete made with the early-strength cement for all mixes was practically equal to the 28-day strength of the ordinary concrete.

"The limestone coarse aggregate gave stronger concrete than the sandstone aggregate in equivalent mixes in all cases.

"The compressive strength of concrete made with the early-strength cement varied with the water-cement ratio in a manner en-

tirely different from that of ordinary portland cement. For the intermediate values of the water-cement ratio, the early-strength concrete was considerably stronger than the ordinary concrete at the age of 3 days and 28 days. For the dry and wet mixes, however, the strengths tended to approach each other.

"The coefficients of thermal expansion were essentially the same for mixes of the some proportions using either cement. For concretes of equivalent strength, however, the early-strength concrete had a slightly smaller coefficient.

"The coefficient of thermal expansion was from 20 to 40% larger for concrete having sandstone for the coarse aggregate than for that having limestone coarse aggregate. This coefficient also tended to increase somewhat with increased richness of mix when sandstone coarse aggregate was used, but showed no such indication when limestone coarse aggregate was used.

"The coefficient of moisture expansion increased with increased quantity of either the early-strength or ordinary cement. For the same proportions of mix the coefficients for the early-strength concretes were from 20 to 65% greater than for ordinary concrete. For concretes of the same 28-day compressive strengths, the early-strength concrete with limestone coarse aggregate had the larger coefficient, the difference for 3500 lb. per sq. in. concrete being 14%. The coefficient was practically the same for early-strength concrete and ordinary concrete where sandstone coarse aggregate was used. The coefficient of moisture expansion for the early-strength concrete was from 10 to 50% less than that for ordinary concrete, for concretes of the same 3-day compressive strength.

"It was stated above that the kind of coarse aggregate caused variations in the thermal coefficient of 20 to 40%, and the kind of cement caused variations in the moisture coefficient of from 20 to 65%. From this, one might conclude that the kind of cement had the greater effect on the volume change. The fact is, however, that the kind of aggregate exerts the greater influence, since the values of the thermal coefficient are about twice as large as the moisture coefficient.

"Assuming a change from dry to saturated condition accompanying an increase in temperature of 100 deg. F., sandstone concrete under conditions favorable to small volume change (2500 lb. per sq. in. compressive strength using portland cement) showed only 6% less volume change than limestone concrete under the most unfavorable conditions (6000 lb. per sq. in. compressive strength using early-strength cement). When oven-dried and then soaked in water, wet mixes absorbed more than dry mixes. Limestone concrete absorbed more than sandstone concrete. Early-strength concrete absorbed less than ordinary concrete."

Rope Testing Machines

A paper on the "Testing of Rope Wire and Wire Rope," by A. V. De Forest and L. W. Hopkins, may be of interest to the users and operators of hoisting machinery. The paper describes the development of test methods from which it is believed it will be possible to predict the service performance of wire rope. The writers point out that the structural engineer is very careful to keep his design stresses in rigid structures very low, but he will permit an operator to swing a load of girders over a busy street by means of a wire rope in which the tension stresses total one-fourth of the breaking strength and the bending stresses total one-half of the breaking strength of the wire rope used. It is obvious that the development of adequate test methods which are applicable to wire and rope are of vital importance to the industry.

For those who are interested in use of manila rope, a paper by N. C. Wiley, of the U. S. Navy Department, on a "Machine Test on the Durability of Manila Rope," will be of interest. The paper summarizes various testing machines and methods which are being employed for predicting the durability of manila rope and describes a device which has been developed by the U. S. Navy for that purpose.

Asbestos Textiles

Those readers who are interested in making preparation for the future will be interested in a paper by C. K. Dillingham, on "Asbestos Textiles," which briefly summarizes the occurrence and methods of mining asbestos fiber and its subsequent manufacture into textiles. The author points out that the ancients used asbestos cloth for wrapping the dead bodies placed on the funeral pyres, and also indicates future uses for this material wherever a heat-resisting medium is needed.

Pumice and Pumicite

PUMICE occurs in California and Oregon, but much of the pumice consumed in the United States is imported from the island of Lipari, near Sicily. Pumice is used mainly as an abrasive. It is also used in construction as an insulating medium, as an aggregate in concrete and acoustic plaster, and in the manufacture of lightweight building units, the development of which is more extensive in Europe than in the United States.

Kansas and Californa produce most of the domestic pumicite. Pumicite is used largely as an abrasive agent in scouring soaps and cleansing compounds, and as an admixture in concrete. It is used to some extent in various abrasive work as a substitute for pulverized pumice.

Consumers usually buy abrasive material on the basis of experience as to its suitability to their own particular requirements and are seldom interested in new supplies as long as they are satisfied with that used.

Pumice or pumicite from different deposits is rarely identical in physical properties. The preparation of pumice and pumicite for market appears to be simple, but producers must realize that the pumice and pumicite industry as a whole is highly specialized and that careful technical and scientific control in all departments is worth while.

Successful exploitation of new deposits depends first upon markets; second, upon the ability to produce at a reasonable profit such material as will adequately satisfy specific market demands; and, third, upon sufficient vision to evaluate, and courage to conform with, changing industrial conditions.

Pumice is a cellular, glassy lava, usually similar in composition to a rhyolite. The term, as commonly applied, means material essentially unaltered since its formation.

Pumicite, on the other hand, is an accumulation of finely divided glass-like particles blown from volcanoes during periods of eruption and subsequently more or less classified while transported by winds. Such material is also called volcanic dust, tuff, and tufa.

An analysis of typical pumice and pumicite would show about the following chemical composition:

	Per cent.
Silica (SiO_2)	72.0
Alumina (Al_2O_3)	14.0
Potash and soda (K_2O and Na_2O)	7.0
Lime and magnesia (CaO and MgO)	2.5
Iron oxide (Fe_2O_3 and FeO)	1.0
Loss upon ignition	3.5

Pumice and pumicite are about as hard as feldspar and slightly softer than quartz. The true specific gravity is approximately 2.5, although the apparent specific gravity may be somewhat less.

This information, together with detailed information on uses, origin and occurrence, deposits in the United States and Canada, preparation for market, domestic production, imports, tariff, and a review of the industry in important foreign producing countries, together with a list of producers, users and importers, is contained in Information Circular 6560 issued by the Bureau of Mines.

Uses Limestone Sand for Slippery Brick Pavements

THE CRASH of automobile accidents on the slippery new mile stretch of brick pavement on Main street just inside the Columbus, Ohio, city limits will no longer resound as it does every rainy day, if an experimental treatment proves successful.

Excess asphalt filler, covering the brick surface, has made the new pavement slippery on rainy days and resulted in at least 50 crashes since the strip was completed last December, residents along the street say.

The treatment consists of pouring kerosene on the surface to soften the excess asphalt left on the bricks, then applying a coating of sharp, finely crushed limestone sand to make a "sandpaper" surface when rolled.—*Columbus* (Ohio) *Citizen.*

Some Changes in the Federal Income Tax Law

By George W. Rossetter

George W. Rossetter & Co., Certified Public Accountants, Chicago; President, Chicago Association of Commerce; General Chairman, National Organization to Reduce Public Expenditures

ON JUNE 6, 1932, the Federal government placed the heaviest burden upon the shoulders of American taxpayers that they have had to bear since 1921. The new tax law imposes 50 new taxes and increases the rates of the old ones. In addition to increases made in the rates of the income tax, many other changes were made in the law which will greatly increase the revenue by limiting deductions for losses of certain types, by decreasing or entirely eliminating exemptions and credits heretofore allowed, and by extending the tax to certain classes of income which have previously been exempted. The Senate Finance Committee estimates that these rate increases and other changes will produce $121,000,000 in additional income tax for the government's fiscal year ending June 30, 1933.

The old income tax law (that in force in 1931) imposed normal tax rates upon net incomes of individuals, of 1½% upon the first $4000, 3% upon the second $4000, and 5% upon the remainder. The new law increases the rates to 4% upon the first $4000 and 8% upon the remainder. The surtax rates under the old law began at 1% upon incomes of more than $10,000 and increased gradually to 20% upon incomes in excess of $100,000. The new bill imposes a rate of 1% upon incomes in excess of $6000 and increases the rate to 55% upon incomes of more than $1,000,000.

In addition to the rate increases, the individual income tax is further increased by a reduction of the personal exemptions allowed. A married person or a head of a family is now allowed an exemption of $2500 instead of $3500 as under the old law, and an unmarried person's exemption is now $1000 instead of $1500. The credit for dependents remains the same under the new law as under the old, that is $400 for each child under 18 years of age, or other dependent incapable of self-support.

The allowance of a credit of 25% of the tax upon earned income has been omitted from the new bill, and no such credit is allowable for 1932 and future years.

In order that the effect of these rate increases and exemption changes might be more clearly seen, I am presenting a table below comparing the tax payable under the old and the new laws by a married person or a head of a family with no dependents and, under the old act, the minimum earned income allowance.

Net income	Tax under old law	Tax under new law	Increase in tax by new law
$ 2,000	.....	.....	.....
3,000	.....	$ 20.00	$ 20.00
4,000	$ 5.63	60.00	54.37
5,000	16.88	100.00	83.12
6,000	31.88	140.00	108.12
7,000	46.88	210.00	163.12
8,000	69.38	300.00	230.62
9,000	99.38	390.00	290.62
10,000	129.38	480.00	350.62
12,000	219.38	680.00	460.62
14,000	339.38	900.00	560.62
16,000	479.38	1,140.00	660.62
18,000	639.38	1,400.00	760.62
20,000	819.38	1,680.00	860.62
30,000	1,979.38	3,480.00	1,500.62
40,000	3,399.38	5,800.00	2,400.62
50,000	5,079.38	8,600.00	3,520.62
60,000	6,999.38	11,900.00	4,900.62
70,000	9,159.38	15,700.00	6,540.62
80,000	11,459.38	20,000.00	8,540.62
90,000	13,859.38	24,800.00	10,940.62
100,000	16,259.38	30,100.00	13,840.62
150,000	28,759.38	58,100.00	29,340.62
200,000	41,259.38	86,600.00	45,340.62
300,000	66,259.38	144,600.00	78,340.62
500,000	116,259.38	263,600.00	147,340.62
1,000,000	241,259.38	571,100.00	329,840.62

The tax payable by an unmarried person would be slightly greater in each instance than that shown for a married person, and that by a married person with dependents would be slightly less.

The requirements regarding information returns by employers and others making payments of salaries, wages, rents, interest, etc., are changed in the new law because of the reduction of the personal exemptions allowed to individuals. These information returns must now be filed in every case where $2500 or more is paid to a married person or the head of a family, and $1000 or more is paid to an unmarried person.

Corporation Taxes

Corporation taxes are likewise increased under the new law (despite the fact that they have been maintained at a high level since the war) by an advance of 1¾% in the rate, i.e., from 12% to 13¾%, and the elimination of the exemption of $3000 which was granted to corporations having a net income of less than $25,000. Moreover, corporations which are affiliated with one another and file a consolidated return must now pay a premium of ¾% for that privilege—the rate for a consolidated return is 14½% instead of 13¾% payable by single corporations.

So much for the rate, exemption, and credit changes. Let us look now to the more important of the changes in the provisions regarding deductions.

The limitation upon the deduction of losses arising from the sale of stocks and bonds is probably the change of greatest popular interest. Congress placed this limitation upon such deductions for a twofold purpose: (1) To protect the Federal revenues from diminution by the growing practice of reducing tax liabilities by the sale of securities upon which losses had accrued, and (2) to prevent taxpayers from wiping out their ordinary income, which represents their real taxpaying ability, by speculative losses.

Distinction Between "Speculative" and "Investment" Securities

In placing this limitation, however, Congress recognized the distinction existing between investment securities and speculative securities. As in previous laws, stocks and bonds which have been held for more than two years are deemed investment securities, or "capital assets," and losses arising from their sale are allowable the same as heretofore.

Stocks and bonds which have been held for two years or less, however, are deemed to be speculative securities and the deduction of losses arising from their sale or exchange is greatly limited, although profits, unless offset by losses, are taxable just the same as they always have been. Losses arising from the sale of such speculative securities are deductible under the new law only to the extent that there are profits from such sales during the year. For example, if in 1932 Mr. Citizen sells at a loss of $10,000 some of the stocks and bonds which he has held for less than two years, and sells others at a profit of $10,000, he may offset the loss against the profit. However, if he does not realize any profit in 1932 from sales of speculative securities, he may not deduct any part of the $10,000 loss in that year.

In cases where only losses are sustained and there are no profits realized, and in cases where there are both profits and losses but the losses exceed the profits, the excess loss may be carried forward to the following year's return and applied against profits of that year arising from the sale of speculative securities. This carry-over privilege is limited, however, in that the amount which may be carried forward may not be greater

than the net income of the year in which the losses were sustained. For example, let us say that Mr. Citizen had an ordinary net income (salaries, interest, dividends, etc.) of $50,000 for 1932. In addition, let us say that he sold speculative securities during that year and sustained a loss of $75,000 on their sale; that he did not realize any profits in 1932 from speculative sales. He may not deduct the $75,000 from his 1932 income, but he may carry $50,000 of it forward to his 1933 return, and if during 1933 he realizes any profit from sales of speculative securities he may offset the profit by the 1932 carry-over to the extent of $50,000. If, however, he does not have any profit in 1933 from sales of speculative securities, he is not permitted to deduct any part of the excess 1932 loss. The privilege of the carry-over is restricted to cases where there is a profit in the following year from sales of securities which have been owned for less than two years. In the example given, it will be noted that the taxpayer sustained a loss of $75,000 in 1932 and that he could not apply any part of that loss against his 1932 income, and that he is permitted to carry over only $50,000 of the $75,000 loss sustained. This is because of the provision of the law which restricts the carry-over to the amount of the ordinary net income of the year in which the loss was sustained, which in the illustrative case was $50,000.

Gains or losses from short sales of stocks and bonds, or attributable to the exercise or sale of privileges or options to sell stocks and bonds, are considered as gains or losses from the sale of speculative securities and are subject to the same limitations.

The limitations set out above are not applicable to dealers in securities, as to stocks and bonds acquired for resale to customers, in respect of transactions in the ordinary course of business. Nor are they applicable to an incorporated bank or trust company, nor to persons carrying on the banking business in respect of transactions in the ordinary course of business. Their losses are deductible in the same manner and to the same extent as under the old law.

"Stocks and Bonds" Defined

The law defines the term "stocks and bonds" as meaning:

(1) Shares of stock in any corporation; or

(2) Rights to subscribe for and receive such shares; or

(3) Bonds, debentures, notes or certificates or other evidences of indebtedness, issued by any corporation (other than a government or political subdivision thereof) with interest coupons or in registerable form; or

(4) Certificates of profit, or of interest in property or accumulations, in any investment trust or similar organization holding or dealing in any of the instruments described above, regardless of whether or not such investment trust or similar organization is a corporation.

Loss Carry-Over Limited to One Year

Another privilege hitherto accorded to taxpayers has been measurably curtailed. That is the privilege of carrying forward the net loss sustained in trade or business in one year to the two succeeding years. Under the old law, if an individual or a corporation, or other taxpayer, sustained a loss in one year from the operation of his trade or business, he was allowed to carry that loss forward and apply it against his income of the following year, and if the income of the following year was insufficient to absorb the loss, the excess could be carried forward and applied against the income of the next succeeding year. The new law limits the carrying forward to one year—the year immediately following that in which the loss was sustained. So, by reason of this provision, a net loss sustained in 1930 may not be carried forward beyond 1931, and a 1931 net loss may be applied against 1932 income only.

Under previous laws there has been confusion among the taxpayers, and in the government ranks, too, as to the cost to be used in determining the gain or loss resulting from the sale or exchange of unproductive real property. The prior laws made no mention of carrying charges upon such property, such as taxes and interest paid on vacant land from which no income is derived. This confusion is eliminated in the new law by the provision that taxes and other carrying charges on unimproved and unproductive real property may be added to the cost or other basis of valuation of the property where such taxes and other charges have not previously been taken as deductions.

The changes described are those of greatest interest to the majority of the country's taxpayers. There are numerous other changes in the new law—they, however, are technical changes, not of general interest, or revisions which are of interest to only limited groups. So, because of their lack of general interest, I have not attempted in the limited space available to describe them.

Highways Are a "Self-Liquidating" Investment

PROFITS FROM IMPROVED HIGHWAYS based on savings in transportation costs, time savings, and increased comfort and convenience in daily life more than equal the cost of such road building and are truly "self-liquidating" investments, declares T. H. Cutler, president of the American Road Builders' Association.

"The profits from the 700,000 miles of improved roads in the United States have been estimated as high as $2,000,000,000 annually," stated Mr. Cutler. "These profits represent the savings over what travel would have cost had these country roads remained in an unimproved state. The losses that result in cities where streets are unimproved are beyond estimation.

"Motor vehicles traveled last year around 180 billion miles, based on gasoline consumption of 15 billion gallons at 12 miles per gallon for each vehicle. It is estimated that at least half this traffic is on the 700,000 miles of improved roads out of the 3,000,000 miles of highways in the United States. Improved roads lead to savings of from 2 to 4c. per mile traveled."

Mr. Cutler believes that these travel savings are but a small part of the profits of improved roads. The balance sheet of improved roads shows also on the credit side social advantages of inestimable value, police protection and increased safety to the traveler, improved postal facilities, increased property values due to better transportation, improved business facilities that benefit the individual merchant, manufacturer and farmer, savings in school administration, and the development of recreational facilities that have resulted in a business with a turnover of several billion dollars annually.

"The benefits of good roads may easily amount to several times the cost computed in dollars, and, in addition, an amount beyond estimation in health, happiness, convenience, safety and higher standards of living that improve the business of every manufacturer and merchant in the country," continued Mr. Cutler. "Highway investments are 'self-liquidating' in more ways than one. Also, they are a capital investment in better business, the profits of the investment being enjoyed for many years."

Feldspar in Canada

THE Dominion Bureau of Statistics at Ottawa, Canada, reports that the production of feldspar in Canada during April amounted to 415 tons as compared with 1160 tons in March and 707 tons in April, 1931.

Tests of Rock Dust Barriers

ROCK DUST BARRIERS are being used extensively in coal mines of the United States, France and Germany, bulletin 353, issued by the U. S. Bureau of Mines, reports. The bulletin then presents a detailed report on tests of rock-dust barriers in an experimental mine conducted by the Bureau. The final conclusion given in the summary is that barriers are secondary safety devices and must never be used as a substitute for rock dusting.

Canadian Gypsum Production in April

THE Dominion Bureau of Statistics at Ottawa, Canada, reports that the production of gypsum in Canada during April amounted to 23,087 tons, an increase of 94.7% over the March shipments but a 29.1% decline from the April, 1931, total. Production during the first four months of 1932 was recorded at 46,161 tons, or 36.4% below the total for the corresponding period of the preceding year. There were no exports of crude gypsum from Canada during April.

Concrete Water Control Apparatus*

By C. L. Brock

Testing Engineer, Froehling and Robertson, Inc., New York City

IN THE ready mixed concrete industry that has been so rapidly developed of recent years there has appeared an ever-increasing need for suitable apparatus and methods with which to control the total mixing water per unit of mixed concrete.

If the concrete plants were dealing only with dried materials there would be little if any difficulty in determining the amount of water required to give the desired consistency for the particular batch of concrete and thereafter it would only be necessary to add a like amount. Equivalent consistency would necessarily follow unless the gradation of the aggregates were materially changed, provided of course that the aggregates were accurately batched as to their respective quantities.

But in average practice the concrete plant has to deal with fine aggregates that vary from 1 to 5% moisture (1½ to 6 gal. per 1000 lb. approx.), and coarse aggregates that vary from 0 to 2% moisture (0 to 5 gal. per 2000 lb. approx.). Hence it is easy to see why it is so difficult to ship concrete to the job with a uniform consistency when it is realized that a variaton of but a single gallon per cubic yard in the total mixing water of a concrete ordered for, say, a 4-in. slump will in plenty of cases make the concrete either too dry or too wet as the case may be.

The plants have in many cases been relying largely upon experienced mixer operators to watch for noticeable changes in the consistency of the concrete as discharged from the mixers and adjust the quantity of mixing water accordingly. Such a system is a little better than a blind baker. The truck-mixing plants have not been nearly so well off in this respect. Outside of making numerous moisture tests, calculations, guesses, etc., they have to in a measure wait for a complaint from the job to tell them that the concrete was not of the proper consistency when delivered. Cases have been noted where the inspectors for the engineer on large jobs were asked to arbitrarily set the water to be added per batch.

Many of the larger plants have gone to considerable expense in attempts to effect accurate water control in their plants and have bought any piece of apparatus that appeared feasible in improving the situation. They have employed persons or firms with reputations or claims of being able to control the consistency of the concrete produced and in many cases have materially helped themselves. The reliable testing laboratories when assigned to such work have as a rule by consistent plugging done good work to this end, with great care and laborious methods.

The principal method of determining the moisture content of the aggregates has been by drying weighed samples and computing the loss, but in most cases this is too slow to be of real value. In a matter of 30 minutes or so a number of loads will have been sent out and by the time corrections can be applied the actual moisture in the aggregates possibly have changed to the extent that the correction is better omitted than applied.

The Chapman flask was a step in the right direction and was promptly accepted by the concrete industry with high hopes that at last the proper tool had been found. In actual practice it was found that this flask could not be filled quickly with moist sand, was not easy to clean after the test, was a bit clumsy or cumbersome to handle especially when the operator must work in haste, and could not be used in determining the moisture or specific gravity of the commercial sizes of crushed stone or gravel.

It is obvious that if 2.65 grams of dry

*Copyright by author. All rights reserved.

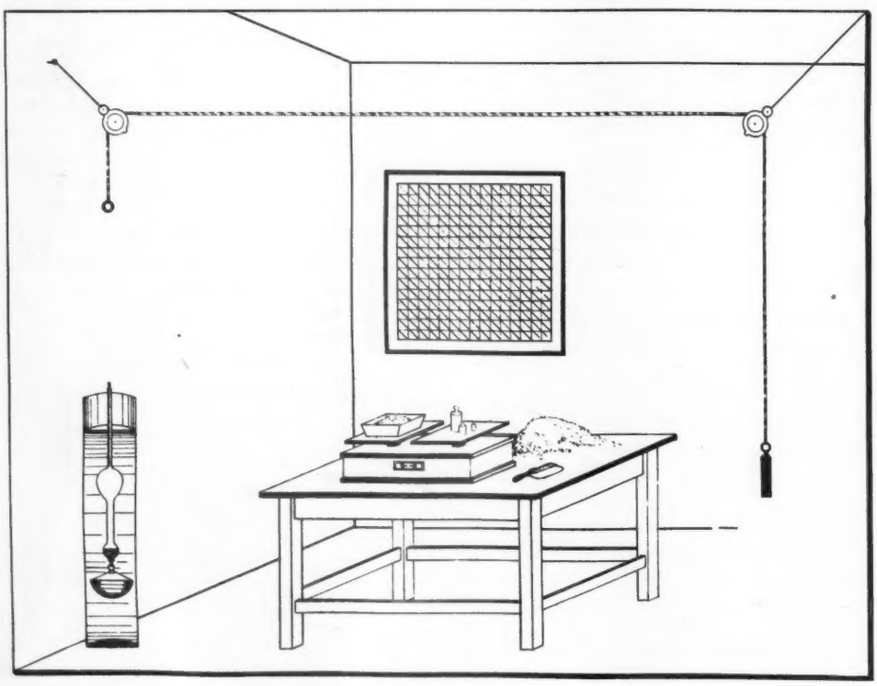


Fig. 1—Schematic set up of apparatus

sand having a specific gravity of 2.65 is weighed in air and is then weighed submerged in water it will weigh only 1.65 grams. Also, if 2.65 grams of such a sand and .35 grams of water, making a total of 3.00 grams of moist sand when weighed in air, is submerged in water the resulting weight will still be only 1.65 grams due to the fact that the water has no weight submerged because its bouyancy is the same as the surrounding medium. Hence we have the rule:

When moist sand of a known specific gravity is successively weighed in air and submerged in water, a simple calculation denotes the moisture percentage.

The simplest method found to do the trick was to get the weight on a good pan balance, using, say, a 500-gram sample, and then determine the bouyancy by using a glass instrument similar to a hydrometer whose upper stem is graduated directly into per cent. moisture or in other desirable units.

The accompanying illustraton, Fig. 2, shows the instrument proper, and Fig. 1 shows the instrument as set up for work. There are two reasons for deciding on the comparatively large size sample of 500 grams: first, to reduce the relative error in weights on small pan balances; and secondly, to permit moisture and specific gravity tests on coarse aggregates. Another type of the instrument obviates the use of the pan balance. Still another use of the instrument is in determining the per cent. clay and silt by decantation without having to dry the materials. It is a rapid procedure and with practical accuracy for general field work.

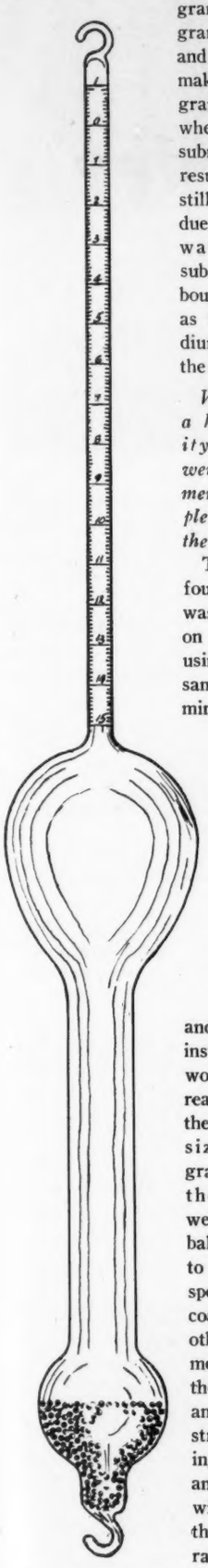
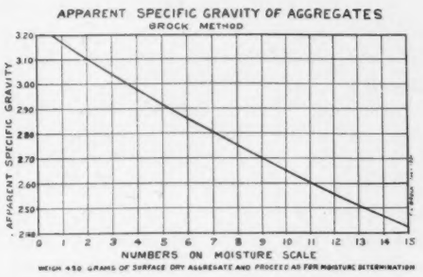


Fig. 2—Moisture determinator

To determine the surface moisture of sand the weighed 500-gram sample is put into the immersion pan with water and stirred to get rid of any air bubbles. The pan is then hooked to the bottom of the instrument and carefully immersed and lowered into the tank. The percentage of surface moisture is read directly at the water level on the graduated scale at the top as soon as the instrument has reached equilibrium.

The percentage of clay or silt in the sand may also be found by making a second determination after washing the sand and figuring the relation between the two results. The apparent specific gravity of any aggregate may be found in connection with the accompanying graph by following the moisture test procedure using a weighed sample of 450 grams of surface dry aggregate. Then the scale reading on the instrument when referred to the graph will give the corresponding apparent specific gravity.



Graph for determining specific gravity

It has been found in actual field use that with proper charts and a convenient set-up, it is possible to make the moisture determinations on the sand of every consecutive batch and furnish the mixer operator with the predetermined amount of water to be added without causing any delay. Of course the necessity seldom arises for the tests to be repeated so rapidly, but it shows the possibilities due to the faster method. While not of extreme precision, the method is accurate to within .2 to .5%.

After a proper survey of the plant, mixes, materials, etc., has been made and suitable charts prepared, "too dry or too wet" first batches in the morning should be a thing of the past and the whole operation can be pinned down to an exacting water control basis. A modern central mixed or truck mixed plant is run on most exacting time schedules when busy and will not as a rule permit dickering around to arrive at a figure on the water to be added per batch.

With such a method as described above, the water-cement ratios for design mixes can be controlled with considerable precision.

Immersion Pan

Liquid Carbon Dioxide as a Refrigerant

THE USE of liquid carbon dioxide as a refrigerant is described in an article by J. H. Pratt, Liquid Carbonic Corp., Chicago, in an article in the June issue of *Industrial and Engineering Chemistry*.

The article states that it has been generally used as a refrigerant in Europe for many years and that this use is now becoming more common in this country. At present only about 2% of the entire production of carbon dioxide is used in refrigeration, about 85% of the total annual production of 100 million pounds being used in soft-drinks. It is also used as a safety explosive in mining, for fire extinguishers and for aging cement products.

It is stated that at least 90% of the liquid carbon dioxide made today is manufactured by the so-called coke process. This consists in burning coke, scrubbing the gases, and then passing them through coke-filled towers where they are dissolved in a lye solution of sodium or potassium carbonates dissolved in water. The solution is passed through heaters to a still and the gas expelled by heating with exhaust steam. After cooling to remove the moisture, the gas is passed through traps and separators and delivered to the liquefying compressor.

Ordinary carbon dioxide contains less than ½% impurities, which are air and water. It is shipped in two standard sizes of containers, holding 20 lb. and 50 lb. It is sold at from 8 to 12c per lb.

The principal argument against its use as a refrigerant has been that comparatively high pressures are used, but these are not excessive as compared to Diesel engine and liquid air practice. It has the advantage of safety and practically as good operating efficiency as other mediums, it is stated. Also, it is inert and stable and does not attack metals or oils. It also has the decided advantage over other refrigerants of not being disagreeable or dangerous to life nor injurious to goods in the event of leakage. It is now largely used by the United Fruit Co. and the U. S. Navy.

Gases Obtained by Heating Commercial Feldspars

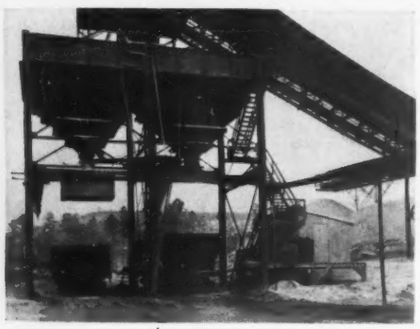
A PRELIMINARY REPORT of an investigation to determine quantitatively the gases obtained by heating a feldspar in vacuo has been issued by the Bureau of Standards as Research Paper 420. The investigation covered 19 samples of the ground commercial material such as is used in the ceramic industry.

Hints and Helps for Superintendents

Stone Sand from Granite Screenings

IN THE granite regions of the south Atlantic states the question of fines from a crushed granite operation is a serious one and to take care of this the Consolidated Quarries Corp. at Lithonia, Ga., installed a modified Allen cone for the classification of stone sand and, in the first two months of its operation, marketed over 50 carloads of what previously was a waste product. The equipment was installed by Nelson Severinghaus, superintendent of the plant.

Plant of Consolidated Quarries Corp.



Loading bins provide for stone sand

Tests on the sand have demonstrated that it is satisfactory for all kinds of concrete work. Permission to use the sand in state and Federal road work has been granted.

The cone is installed below the bins that are used for loading aggregate and is connected to the bottom of the bins by a steel launder. When it is desired to load sand the loading bins are filled from the stock piles in the same manner that regular aggregate is shipped and a small stream of water loosens the sand and permits it to flow to the cone. The overflow material is carried to waste through a second steel launder while the cone discharges the washed sand direct to cars. The chute connecting the bottom of the cone is removable so that when coarse aggregate is being loaded the device is not in the way. A 50-ton car of sand can be loaded in this way in about 30 min. As the quarry has practically no overburden there is no foreign matter to wash out, hence only a small amount of water is required for the cone's operation.

Cone for stone sand classification

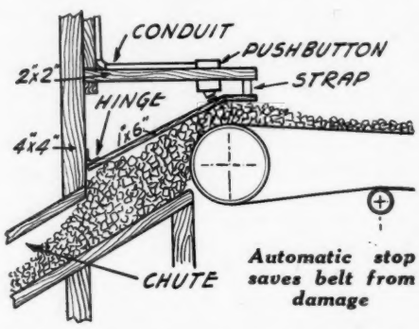
Automatic Stop for Conveyor Belt

By Dare Paris
Monrovia, Calif.

THE accompanying illustration shows a means of protecting and automatically stopping a conveyor belt when the chute becomes blocked. Many delays and much damage have been done in stone plants to conveyor belts by chutes blocking up, screens stopping, bunkers filling up and so on, causing the material to fill up the chute and rub against the conveyor belt tearing the rubber off and often times tearing the belt.

Note that the "stop" push button is installed above the conveyor on a 1x6-in. board hinged to the head of a box which gives about a 3-in. clearance above the material on the belt. The clearance between the 1x6-in. board and the "stop" button is about 1 in. When the chute becomes stopped up the rock pushes against the 1x6 causing it to operate the push button, cutting off the current and stopping the motor.

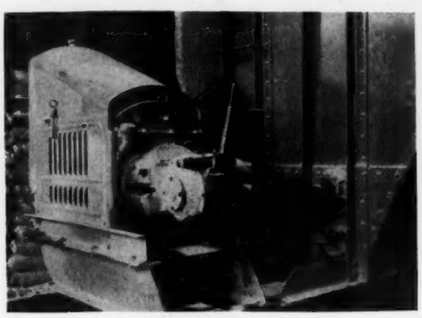
When the plant is not operated by electric power or equipped with push button type starting boxes, a wet cell battery can be used to ring a bell giving the signal that the screen is stopped and the chute blocked.



Automatic stop saves belt from damage

Handling Bulk Cement

THE BOSTON Concrete Co., a subsidiary of the Boston Sand and Gravel Co., Boston, Mass., has a novel method of



Drive for unloading screws

Complete unit for transporting bulk cement

delivering bulk cement to its plant. A bin and unloading equipment is installed at the rail siding which is about ½ mi. from the plant. It is delivered to the plant by a special truck body. The chassis of the truck was built by the Windsor Tractor Equipment Co., but the balance of the body, mounting, etc., were designed locally.

As shown in an accompanying illustration, the body of the truck is hoppered so as to feed two screw conveyors located in the bottom of the hopper. The screws are used for unloading the cement and are driven by a separate Hercules gasoline engine through two silent chain drives. The body holds 60 bbl. of cement. A McCormick-Deering tractor is used to haul the truck body.

Mounting Vibrating Screens

IN THE Miamiville, Ohio, plant of the Ohio Gravel Co., vibrating screens replaced several of the rotary screens previously used. The one shown in the illustration, a 4- x 14-ft. Niagara screen, is used as a rescreener and is mounted in a novel way.

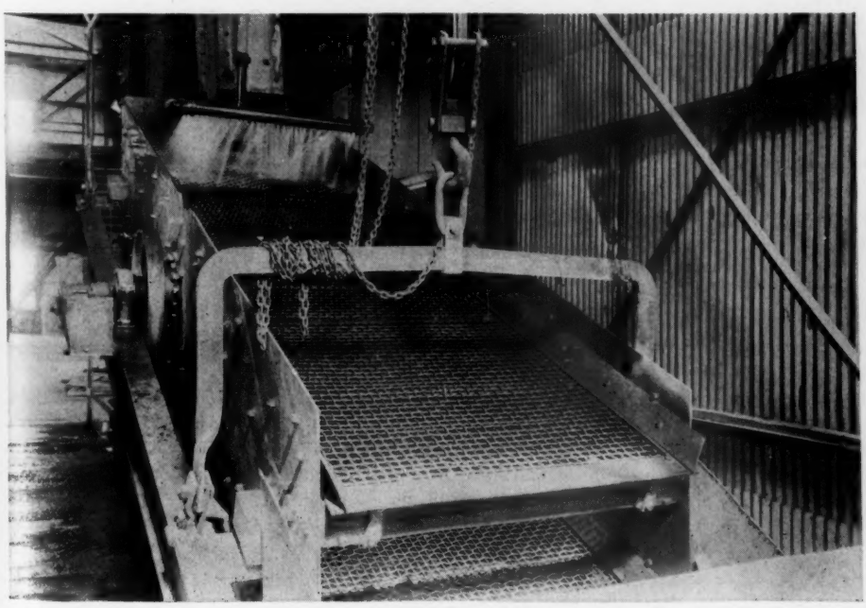
By means of a chain hoist the lower end of the screen can be raised or lowered. In this way desired variations in the slope of the screen can be quickly made to meet a variety of conditions.

An Improvised Water Tank

By C. H. Wright
Snyder, N. Y.

THE OLD wooden water tank at a quarry where we were operating a shovel became so leaky that I made a metal tank that was inexpensive and has been most satisfactory. This was done by working over the shell of an Erie steel boiler.

Stay bolts and mud rings were burned off. A two-ply tar paper gasket was placed under a steel plate which was bolted over the fire hold door, and other openings were similarly closed. The 2-in. safety valve hole was used as the outlet, and was high enough from the bottom that it allowed water to be withdrawn without removing settlings from the bottom of the tank. There is a ¾-in. drain plug in the bottom of the tank so that it can be cleaned at intervals and can also be drained in the fall before freezing weather.



Chain hoist makes it easy to vary slope of screen

Old boiler converted to water tank

The storage tank is slightly larger than the tank on the crane which it supplies, so that it can fill the crane in one operation without any delay.

Air Release for Air-Lift Pump

THE Makins Sand and Gravel Co., Sulphur, Okla., uses air lifts for pumping water for washing. This system of pumping requires the introduction of a considerable volume of air under relatively high pressure into the well, and when this water is released at or near the point of use some system must be provided for separating the air from the water. These operators have provided a simple, homemade device consisting of two oil barrels welded together as shown in the illustration. The incoming water and air rises in the pipe at the right and the water flows through the two ducts into the barrels. The air passes on to the atmosphere through the extension of the incoming water pipe. The elevation of the tank is sufficient to supply the necessary head.

The device rests at the top of the plant and the water flows from this apparatus to the various points of use.

Two oil drums release air from water

Urges More Liberal Anti-Trust Laws

POINTING OUT that the Federal anti-trust laws tend to establish a roof or a top for prices as a proper safeguard against selfishness and greed, yet do not establish a bottom, the current *Weekly Bulletin* of Ernst & Ernst, accountants, sees the laws as restrictive of certain practices which would stand the test of broad public interest and suggests that some protection against destructive spirals of prices is needed.

Liberalization of the anti-trust laws to permit groups of producers to agree that each will not sell below his own costs, is declared essential.

"In good times producers expand their production programs beyond the reasonable bounds of a continuing market," the bulletin says. "In bad times they try in vain to maintain their shrunken markets by cutting prices, which thereupon produces a never-ending circle of price-cutting and a demoralization extending into credit, employment and other relations."

This situation, now faced by practically all industries, can be remedied by the co-operative action of business men as a class, it is declared. But various well-intentioned efforts in this direction are said to have been prevented by uncertainties regarding the meaning of the anti-trust laws as interpreted variously by the courts and as enforced by government authorities.

The bulletin holds that it is neither politically possible nor economically desirable to repeal the anti-trust laws. "They are not merely artifices written into the statute books, but statements of social and economic doctrine inherent in the American system. Free competition and open opportunity for advancement of new ideas or superior ability represent a cornerstone of our national edifice. Those who advocate outright repeal of the anti-trust laws are unacquainted, perhaps, with American history and tradition."

"Neither is it in the public interest," the bulletin continues, "to permit the arbitrary fixing of prices, even if this were politically feasible. In the first place, no price-fixing plan ever worked successfully and permanently. The record shows that even in cases where there was no governmental restriction, the forces of competition eventually caused a break in agreements to stick to certain prearranged prices. In the second place, the laws do not permit price-fixing. If the laws were to be changed so as to legalize it, the practice would necessarily be accompanied by governmental control and regulation, so that the vagaries of fluctuating political policy would be injected into business to a far greater extent than at present. It would be a direct step toward governmental dictation of business, and the forces of business are too delicate and too complicated to be subjected to political dictation by any government.

"Putting repeal of the anti-trust laws and legalized price-fixing out of the picture, however, it still remains a fact that business men themselves could and would, if permitted by the laws, work out of the chaos caused by indiscriminate price-cutting and unrestrained competition.

Trade Associations Should Be Used

"It should be not only the privliege but also the duty of concerns in the same line of business to cooperate among themselves to promote business practices which are good for themselves and equally good for their customers or the general public. The machinery already exists in the form of trade associations, many of which are doing excellent work. They are, or should be, specialized service centers for developing and executing plans to promote the best interests of their respective trades or industries, and with a sufficiently broad conception to make customer interest or public interest practically coincidental with the interest of their special group.

"There is no real distinction between producer interest on the one hand and consumer or public interest on the other hand. All producers are consumers, and most consumers are producers, and the two conceptions are merely different aspects of the same thing. Public interest includes both phases, especially as economic organization gets more complicated and functions become more specialized. Most so-called consumers are dependent on wages and dividends, which in turn are dependent on the maintenance of industries.

"There is no easy way of listing all the practices which might well be legalized. Certainly one meritorious suggestion is that agreements among producers to refrain from selling below cost be not illegal, provided these are made under certain specific safeguards and with a measure of government observation and supervision. "Cost" in this case would not be a flat or average cost for the entire industry, but the actual cost of each competing unit. Thus prices would not be fixed and competition would not be destroyed. There would be merely the regulation of that bitter competition which dissipates the capital, and enables some concerns to use their accumulated capital as an unfair weapon against the concerns with less capital.

"There is a point beyond which competition is no longer good for either the competitors or the customers or the general public. Many industries have already passed this point.

"The processes of competition are gradually working toward the destruction of many units which will be needed in the future to supply the country's requirements for commodities and services, and toward the destruction of the credit which has been built upon the operations of these units. If it were merely the inefficient units which were being destroyed, the situation might be tolerable, for this would represent only a weeding-out process in the interest of an ultimately better economic mechanism. The trouble is that some efficient units are not moneyed units; they do not have large reserves. Excessive price-cutting tends to make the survivor the unit which has the largest accumulated reserves, although it is not necessarily the unit which turns out the best possible product at the lowest possible cost in the most efficient manner. The survival, therefore, may be for the "fattest" rather than for the fittest, and this is not in the public interest. Furthermore, price-cutting often degenerates into deceptive quality-cutting.

"No one pretends to think that the great forces of price fluctuations can be abolished by mere agreements among producers. No one wants a static or frozen state of business, either by private agreement or by public control. It is not the abolition of competition which is desired, but merely the regulation of certain forms of destructive competition. Laws will not accomplish this, but laws may allow head room or elbow room for emergency or experimental agreements. Laws may give business the permission to make endeavors in what seems to be the right direction. It can be frankly admitted that there are potential dangers of excesses, but these are perhaps no greater than the real and pressing dangers of permitting continuation of unregulated competition.

"Current conditions are frequently described as an emergency second only to that of war time. During a war emergency the government may act against profiteering and runaway prices. At present there is growing sentiment for liberalization of anti-trust laws to permit reasonable correction of the forces which make for destructively low prices."

Movie Films of the Bureau of Mines

AN ABBREVIATED LIST of motion picture films available from the Bureau of Mines has been issued in which the rules governing distribution are also given. Among films of interest to the rock products industry are: Sulphur; Asbestos; Story of Rock Drilling; Manufactured Abrasives; Story of Heavy Excavating Machinery; Story of Dynamite; Twelve Points of Safety, and the Story of a Rock-Dusted Coal Mine.

Editorial Comment

Future Funds For Highway Construction

It should be quite obvious to all who follow the trend of public events that the sources from which funds have come for the building of our present national and state highway systems are in serious danger of drying up. The great and growing rebellion of taxpayers against any and all taxes is causing indiscriminate demand for reduction of all public expenditures. Highway expenditures are included, naturally, although many of us believe unjustly and most unwisely. Federal and state appropriations for highways have suddenly come to be looked upon as undesirable subsidies at the expense of the general taxpayer; even money raised especially for highway work by gasoline and motor-vehicle taxes is being used for other purposes on the pretext of returning to business and real property taxpayers some of their money spent for highways in times past.

Obviously it is the task of every reader, of all of us who realize the fallacy of these arguments, whose business lives depend in a large measure on highway construction, to fight this growing menace. But mob psychology is a difficult thing to contend with except by a slow process of education, requiring not only time but money for promotional work. Nor should we be satisfied in view of our present situation and the obvious trend of public sentiment with leaving all our eggs in one basket.

There is one great source of future funds for highway construction and maintenance now largely untapped. This is the commercial use of the highways by common carriers. Isn't it time they began paying? Wouldn't it be better for all of us if this traffic were properly and adequately regulated? After all, aren't we as much interested in preserving the railways as we are in building highways? Until four or five years ago the railways used annually almost as much cement, stone, sand and gravel as was required for highway construction. Only because the railways have almost entirely ceased to buy has the highway construction market become all important. Isn't just as much to be gained by restoring the railway market as by soliciting new government appropriations for highway building?

The following argument by W. E. Wedekind, counsel for the Pacific Electric Ry., a subsidiary of the Southern Pacific Co., before the California Railroad Commission at a recent hearing, seems to us eminently fair and logical. Mr. Wedekind said, in part:

"The use of the public highways in this state for the transportation of property for compensation by motor vehicles is an extraordinary use and as such may be enjoyed not as a right but as a privilege which the state may withhold or grant, upon such terms and conditions as the public convenience and safety, the protection and proper use of the highways, the investment of the public in the highways and the preservation of existing essential agencies of transportation may require; the protection of the public highways against unnecessary congestion, the protection of users of the highways against unnecessary inconvenience and hazard, and the maintenance of a reliable, substantial and efficient transportation system are all matters of statewide concern.

* * * * * *

"It is obvious that the existing regulated transportation agencies can only be maintained by preserving for them an opportunity to handle traffic on an equal basis with other transportation agencies. If competition is to be equal, the burden assumed by the competitors must be substantially equal. If competition continues to be unequal, the result will be the destruction of the railroads. The destruction of the railroads means the destruction of the state's great basic industry—agriculture."

He might have added that the destruction of the railways' buying power has already gone a long way to wreck other great basic industries; and that the unregulated truck freight carrier, with no schedule of rates, or tariffs, had in fact already wrecked the price structures (and sooner or later the business structures) of many basic industries, not only in California, but everywhere else in this country. Both good citizenship and business sense should influence every rock products producer in seeing that the railways are given a fair break.

Our Mistake—No Tax on Industrial Electricity!

We devoted the editorial page of Rock Products, June 18, to a discussion of the effect of the new Federal tax law on the rock products industry, emphasizing particularly the tax of 3% on electrical energy. It seems, along with a great many other people, we misinterpreted the section of the new law which reads as follows: [Sec. 616(a)] "There is hereby imposed a tax equivalent to 3 per centum of the amount paid on or after the fifteenth day after the date of the enactment of this Act, for electrical energy for domestic or commercial consumption," etc. Apparently the tax was intended primarily to cover the *(household)* domestic use of electricity, and is not intended to apply to the *industrial* use of electricity. The Treasury Department has so far attempted to define industrial use as "use in manufacturing, processing, mining, refining, irrigation, shipbuilding, construction, public utilities." The Treasury Department has still to draw the line between "commercial" use and "industrial" use of electrical energy.

We are sorry to have misled our readers in the editorial of the June 18 issue, but we think our mistake excusable; and it really does illustrate the strange defects and curious loopholes in the new revenue law—a hodge-podge of internal revenue regulations and tariff law. However, if the editorial misled you into a determination to increase your prices to try to balance your company budget, we beg of you not to let this present correction change your attitude.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	6-29-32	92	98	
Alpha P. C. com.	6-25-32	5	6	25c qu. Apr. 25
Alpha P. C. pfd.	6-25-32	75	90	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[39]	5-28-32	85	90	
American Aggregates com.[19]	6-27-32	1	4	
American Aggregates pfd.[19]	6-27-32	10	20	1.75 qu. Jan. 1
Amer. Aggr. 6's, w.w.[19]	6-27-32	30⅛	38	
Amer. Aggr. 6's, ex.w.[19]	6-27-32	28⅛	36	
Amer. L. & S. 1st 7's[27]	6-28-32	70	80	
American Silica Corp. 6½'s[39]	6-29-32	No market		
Arundel Corp. new com.[2]	6-25-32	14	17	75c qu. July 1
Bessemer L. & C. Class A	6-24-32	.....	2	
Bessemer L. & C. 1st 6½'s[4]	6-24-32	10	18	
Bloomington Limestone 6's[27]	6-29-32	.....	20	
Boston S. & G. new com.[37]	6-25-32	3	6	15c qu. July 1
Boston S. & G. new 7% pfd.[37]	6-25-32	20	30	87½c qu. Apr. 1
California Art Tile, A	6-24-32	1½	4¼	
California Art Tile, B[9]	6-23-32	.....	5	
Calaveras Cement com.	6-24-32	.....	2	
Calaveras Cement 7% pfd.	6-24-32	.....	70	1.75 qu. July 15
Canada Cement com.	6-27-32	2¼	2½	
Canada Cement pfd.	6-27-32	20	.....	1.62½ qu. June 30
Canada Cement 5½'s[42]	6-23-32	68	72	
Canada Crushed Stone bonds[42]	6-23-32	55	65	
Canada Crushed Stone com.[42]	6-23-32	2	.....	
Certainteed Products com.	6-28-32	1	1⅝	
Certainteed Products pfd.	6-28-32	6	8¾	1.75 qu. Jan. 1
Certainteed Products 5½'s	6-25-32	27⅛	Act. sale	
Cleveland Quarries	6-28-32	.....	54	10c qu. June 1
Consol. Cement 1st 6½'s, A[44]	6-28-32	4	7	
Consol. Cement notes, 1941[37]	6-29-32	No market		
Consol. Cement pfd.[37]	6-29-32	45	.....	
Consolidated Oka Sand and Gravel (Canada) 6½'s[42]	6-27-32	70	80	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	6-23-32	.....	50	1.75 qu. Oct. 10, '31
Consol. Rock Prod. com.[35]	6-23-32	10c	20c	
Consol. Rock Prod. pfd.[35]	6-23-32	20c	35c	
Consol. Rock Prod. units[35]	6-23-32	½	1	
Consol. S. & G. pfd. (Can.)[42]	6-23-32	.....	50	1.00 qu. May 16
Construction Mat. com.	6-28-32	.....	2	
Construction Mat. pfd.	6-28-32	1	3⅜	
Consumers Rock and Gravel, 1st Mtg. 6's. 1948[35]	6-23-32	24	28	
Coosa P. C. 1st 6's[23]	6-23-32	14	25	
Coplay Cem. Mfg. 1st 6's[33]	6-23-32	50	61	
Coplay Cem. Mfg. pfd.[33]	6-23-32	10	12	
Dewey P. C. com.[47]	6-28-32	75	85	
Dolese and Shepard	6-28-32	15	17	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.[42]	6-23-32	.....	28	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.[42]	6-23-32	.....	5	
Edison P. C. com.[27]	6-29-32	3	6	
Federal P. C. 6½'s[47]	6-28-32	55	60	
Giant P. C. com.[2]	6-25-32	1	3	
Giant P. C. pfd.[2]	6-25-32	3	6	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	6-27-32	2¼	2⅝	10c qu. Oct. 5, '31
Gyp. Lime & Alabastine 5½'s[43]	6-23-32	.....	40	
Hermitage Cement com.[11]	6-27-32	5	7	
Hermitage Cement pfd.[11]	6-27-32	20	25	
Ideal Cement 5's, 1943[29]	6-25-32	73	78	
Ideal Cement com.[29]	6-25-32	6½	8½	50c qu. July 1
Indiana Limestone units[27]	6-29-32	No market		
Indiana Limestone 6's	6-24-32	5	10	
International Cem. com.	6-27-32	4⅜	4¾	50c qu. Mar. 31
International Cem. bonds, 5's	6-28-32	48	Act. sale	Semi-ann. int.
Kelley Is. L. & T. new stock	6-28-32	7	10	25c qu. July 1
Ky. Cons. Stone com.	6-28-32	.....	2	
Ky. Cons. Stone pfd.	6-28-32	.....	50	
Ky. Cons. St. 1st Mtg. 6½'s[46]	6-23-32	15	20	
Ky. Cons. St. V. T. C.[46]	6-23-32	½	1	
Ky. Rock Asphalt com.	6-28-32	1¾	2½	
Ky. Rock Asphalt pfd.	6-28-32	20	25	1.75 qu. Dec. 1, '31
Ky. Rock Asphalt 6½'s	6-28-32	.....	70	
Lawrence P. C.	6-27-32	.....	9	
Lawrence P. C. 5½'s 1942[2]	6-25-32	25	32	
Lehigh P. C. com.	6-28-32	4	6	
Lehigh P. C. pfd.	6-28-32	48¼	50	1.75 qu. July 1
Louisville Cement[7]	6-23-32	60	80	
Lyman-Richey 1st 6's, 1935[13]	6-10-32	60	.....	
Marblehead Lime 6's[14]	6-24-32	No market		
Marbelite Corp. com.[35] (cement products)	6-23-32	3c	75c	
Marbelite Corp. pfd.[35]	6-23-32	50c	.....	
Marquette Cement com.[47]	6-28-32	3	4½	
Marquette Cement pfd.[47]	6-28-32	45	55	
Marquette Cem. Mfg. 1st 5's, 1936[46]	6-28-32	80	85	
Marquette Cem. Mfg. 1st 6's, 1936[46]	6-28-32	85	90	
Material Service Corp.	6-28-32	.....	10	
McCrady-Rodgers 7% pfd.[22]	6-22-32	25	30	87½c qu. Dec. 30, '31
McCrady-Rodgers com.[22]	6-22-32	3	5	75c qu. Jan. 26
Medusa P. C. pfd.[47]	6-28-32	30	40	1.50 qu. Apr. 1
Medusa P. C. com.	6-28-32	4⅝	5	
Monarch Cement com.[47]	6-28-32	40	50	
Michigan L. & C. com.[6]	6-25-32	45	.....	
Missouri P. C.	6-28-32	5	.....	25c qu. Jan. 30
Monolith Portland Midwest com.[35]	6-23-32	40c	60c	
Monolith Portland Midwest pfd.[9]	6-23-32	25c	35c	
Monolith P. C. com.[9]	6-23-32	½	1	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	6-23-32	1.12½	2	40c s.-a. Jan. 1
Monolith P. C. units[9]	6-23-32	2¾	5	
Monolith P. C. 1st Mtg. 6's[9]	6-23-32	33	36	
National Cem. (Can.) 1st 7's[27]	6-29-32	80	90	
National Gypsum A com.[27]	6-29-32	1	2	
National Gypsum pfd.[27]	6-29-32	21	23	1.75 qu. July 1
National Gypsum 6's[8]	6-28-32	40	50	
Nazareth Cement com.[25]	6-10-32	3	.....	
Nazareth Cement pfd.[25]	6-10-32	45	.....	
Newaygo P. C. 1st 6½'s[27]	6-29-32	72	.....	
New England Lime 6's, '35[14]	6-24-32	10	12	
N. Y. Trap Rock 1st 6's	6-24-32	55	Act. sale	
N. Y. Trap Rock 7% pfd.[30]	6-29-32	.....	35	1.75 qu. Apr. 1
North Amer. Cem. 1st 6½'s	6-24-32	13¼	16⅞	
North Amer. Cem. com.[48]	6-23-32	.....	1	
North Amer. Cem. 7% pfd.[48]	6-23-32	1	2	
North Shore Mat. 1st 5's[15]	6-28-32	30	.....	
Northwestern States P. C.[47]	6-28-32	24	28	
Ohio River S. & G. com.	6-28-32	.....	8	
Ohio River S. & G. 7% pfd.	6-28-32	.....	98	
Oregon P. C. com.[9]	6-23-32	8	12	
Oregon P. C. pfd.[9]	6-23-32	80	85	
Pacific Coast Aggr. com.[40]	6-23-32	.....	½	
Pacific Coast Aggr. pfd.[40]	6-23-32	.....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	6-27-32	13	15	
Pacific Coast Aggr. 7's, 1939[5]	6-27-32	1½	3½	
Pacific Coast Cement 6's[5]	6-27-32	45	.....	
Pacific P. C. com.	6-24-32	3	6	
Pacific P. C. pfd.	6-24-32	.....	48	1.62½ qu. July 5
Pacific P. C. 6's	6-24-32	.....	93	
Peerless Cement com[21]	6-24-32	25c	75c	
Peerless Cement pfd.[21]	6-24-32	3	5	
Penn.-Dixie Cement com.	6-28-32	½	¾	
Penn.-Dixie Cement pfd.	6-28-32	3¼	5⅛	
Penn.-Dixie Cement 6's	6-29-32	28	Act. sale	
Penn. Glass Sand Corp. pfd.[19]	6-27-32	.....	55	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's	6-27-32	68	72	
Petoskey P. C.	6-28-32	1	1½	
Port Stockton Cem. com.[9]	6-23-32	No market		
Riverside Cement com.[9]	6-23-32	.....	12	
Riverside Cement pfd.[9]	6-23-32	55	60	1.50 qu. Feb. 1
Riverside Cement, A	6-24-32	.....	7	
Riverside Cement, B[9]	6-23-32	70c	1	
Sandusky Cement 6½'s, 1932-37[19]	6-27-32	60	75	
Santa Cruz P. C. com.	6-24-32	32	.....	$1 qu. July 1
Schumacher Wallboard com.	6-24-32	1	.....	
Schumacher Wallboard pfd.	6-24-32	3	14	50c qu. May 15
Signal Mt. P. C. pfd.[47]	6-28-32	2	5	
Southwestern P. C. units[35]	6-23-32	200	.....	
Southwestern P. C. pfd.[35]	6-23-32	70	.....	
Standard Paving & Mat. (Canada) com.[42]	6-23-32	1	2	
Standard Paving & Mat. pfd.[42]	6-23-32	.....	30	1.00 qu. May 16
Superior P. C., A[9]	6-23-32	23	27	27½c mo. June 1
Superior P. C., B[9]	6-23-32	4	5¼	12½c July 20
Trinity P. C., units[47]	6-28-32	20	25	
Trinity P. C. com.[47]	6-28-32	1	3	
Trinity P. C. pfd.[47]	6-28-32	19	22	
U. S. Gypsum com.	6-28-32	11	11½	40c qu. June 30
U. S. Gypsum pfd.	6-28-32	87	95¼	1.75 qu. June 30
Wabash P. C.[21]	6-27-32	5	8	
Warner Co. com.[16]	5-27-32	1¾	2	25c qu. Oct. 15, '31
Warner Co. 1st 7% pfd.[16]	5-27-32	30	50	1.75 qu. Apr. 1
Warner Co. 6's, 1944, with war.	6-24-32	.....	50	
Whitehall Cem. Mfg. com.[30]	6-27-32	.....	80	
Whitehall Cem. Mfg. pfd.[30]	6-27-32	.....	55	
Wiscon. L. & C. 1st 6's, '33[15]	6-28-32	30	.....	
Wolverine P. C. com.	6-28-32	.....	1	15c qu. Nov. 15, '31
Yosemite P. C. A. com.[9]	6-23-32	90c	1.10	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hemphill, Noyes and Co., New York City.

Wolverine Portland Cement

THE annual report of the Wolverine Portland Cement Co., Coldwater, Mich., for the year ended December 31, 1931, contains the following remarks: Michigan, with nearby states, has had a very good highway program, which in most cases was financed by a gasoline and weight tax. Shipments to the state of Michigan for highways and bridges amounted to 50% of the total shipments of the company, leaving a very small percentage for dealer distribution in comparison with other years.

The Coldwater mill was operated about six months of the year, with a midsummer shutdown, placing the mill in operation again in October, November and December, which operations owing to reduction of wages and salaries and decreased cost of coal made a very material reduction in bin cost.

"We have not mortgaged the coming year's business by accepting contracts at the prevailing low prices."

The mills are in a very good condition; and with the exception of the usual repairs, will be ready to operate when business conditions demand it.

INCOME ACCOUNT

Years ended December 31	1931	1930
Net sales	$ 278,221	$ 590,789
Cost of sales	322,265	426,392
Depreciation and depletion	60,983	64,997
Operating expenses	47,159	69,614
Operating loss	152,185	*29,786
Other income	6,886	6,609
Total loss	145,299	*36,395
Taxes, etc.	12.032	4,357
Net loss	157,331	*32.038
Dividends	.....	60,000
Deficit for year	157,331	27,962
Previous surplus	163,705	198,115
Reserve for decline in investments (dr.)	13,375	.....
Sundry surplus adjustments (dr.)	414	6,447
Reserve for insurance (cr.)	40.000	.....
Profit and loss surplus	32,585	163,705

*Income.

BALANCE SHEET
ASSETS
(As of December 31)

Current assets:	1931	1930
Cash	$ 99,551	$ 126,572
Investments (market)	25,581	44,177
Notes, accounts receivable	11,100	32,869
Inventories	225,846	304,881
Total current assets	$ 362.078	$ 508.499
Fixed assets	664,916	708,804
Deferred	23,243	7,710
Total assets	$1,050,237	$1,225,013

LIABILITIES

Current liabilities:		
Accrued taxes	$ 12,455	.....
Accrued expenses	5,198	$ 2,212
Accounts payable	.....	14,739
Provision for income tax	.....	4,357
Total currents liabilities	$ 17,652	$ 21,308
Capital stock	1,000,000	1,000,000
Appropriation of insurance reserve	.....	40,000
Profit and loss surplus	32,585	163,705
Total liabilities	$1,050,237	$1,225,013

Structural Gypsum Corp.

THE Structural Gypsum Corp., Linden, N. J., a subsidiary of the American Cyanamid Co., has concluded negotiations whereby it will acquire on July 1 the assets and business of Zenitherm Co., Inc., manufacturers of Zenitherm ornamental floor and wall tile.

Beaver Portland Cement

THE Beaver Portland Cement Co., Portland, Ore., reports for the year ended December 31, 1931:

INCOME ACCOUNT

	1931	1930
Sales	$ 329,102	$ 519,711
Cost of sales, etc.	247,266	404,771
Depreciation and depletion	52,229	55,436
Operating income	29,606	59,504
Other income	3,185	2,695
Total income	32,791	62,199
Interest charges	22,125	23,801
Tax provision	7,223	9,219
Other deductions	12,000	30,417
Net loss	8,557	1,238
Preferred dividends	.....	15,517
Deficit	$ 8,557	$ 16,755

BALANCE SHEET

Assets:	1931	1930
Plant and equipment	$1,789,605	$1,785,168
Current assets:		
Cash	17,728	6,048
Notes and accounts receivable	49,266	52,911
Inventories	151,050	170,870
Other current assets	2,985	1,552
Due from affiliated companies	23,366	23,219
Deferred charges	72,318	74,687
Total	$2,106,317	$2,114,455
Liabilities:		
Preferred stock	$ 443,330	$ 443,330
Common stock	500,000	500,000
Funded debt	283,500	304,000
Current liabilities:		
Notes and accounts payable	18,546	42,640
Accrued interest	3,307	3,547
Tax reserve	7,481	9,312
Reserve for depreciation	377,992	329,316
Other reserves	19,525	20,050
Deferred credits	6	106
Surplus	452,630	462,154
Total	$2,106,317	$2,114,455
Current assets	221,028	231,381
Current liabilities	29,335	55,499
Working capital	$ 191,694	$ 175,882

Alpha Portland Cement Omits Dividend

THE directors of the Alpha Portland Cement Co., Easton, Penn., have decided to omit the quarterly dividend ordinarily payable about July 25 on the outstanding 711,000 common stock, no par value. From April 25, 1931, to and including April 25, 1932, quarterly distributions of 25 cents per share were made.

President G. S. Brown said: "The present demand for cement is less than it has been for many years. The price received is below cost. The directors of the company feel that under these circumstances the present strong cash position of the company should be maintained, therefore no action was taken on the dividend ordinarily declared on the common stock at this time."

Boston Sand and Gravel Co. Dividend Reduced

THE directors of the Boston Sand and Gravel Co., Boston, Mass., have declared a quarterly dividend of 5c. per share on the common stock, payable July 1 to holders of record June 22. This compares with quarterly distributions of 15c. per share made on this issue from July 1, 1931, to and including April 1, 1932, 30c. per share paid on April 1, 1931, and 40c. previously each quarter.

Limestone Products Corp. Rescinds Dividend

THE directors of the Limestone Products Corp. of America, Newton, N. J., recently decided to rescind the quarterly dividend of 62½ c. per share previously declared on the 7% cumulative preferred stock, par $50, for payment on April 1 to holders of record March 15. The last previous distribution at this rate was made on January 1, 1932.

National Gypsum Co. Dividend

THE directors of the National Gypsum Co., Buffalo, N. Y., have declared a dividend of $1.75 a share on the $7 cumulative preferred stock payable July 1 to holders of record June 15 and covering the quarter from April 1 to June 30, 1932. Dividends in arrears, after this payment, amount to $21.50 a share on the stock. A similar distribution was made on Oct. 1, 1931, and on Jan. 2 and April 1, 1932. Dividends of $1 each were paid Jan. 2, April 1 and July 1, 1931.

Pennsylvania Glass Sand Corp. Omits Preferred Dividend

AT the regular monthly meeting of the board of directors of the Pennsylvania Glass Sand Corp., Lewistown, Penn., it was decided to omit the regular quarterly dividend on the preferred stock usually paid on July 1.

While earnings for the second quarter were, as in previous years, greater than those of the first quarter, in view of the uncertain outlook for the balance of the year, a conservative policy looking to the maintenance of the cash position was deemed advisable and in the best interest of the stockholders.

Recent Dividends Announced

Arundel Corp. com. (qu.)	$0.75,	July 1
Boston Sand and Gravel com. (qu.)	0.05,	July 1
Calaveras Cement 7% pfd. (qu.)	1.75,	July 15
Ideal Cement (qu.)	0.50,	July 1
Johns-Manville Corp. pfd. (qu.)	1.75,	July 1
Kelley Island Lime & Transport com. (qu.)	0.25,	July 1
National Gypsum pfd. (qu.)	1.75,	July 1
Pacific Portland Cement pfd. (qu.)	1.62½,	July 5
Santa Cruz Portland Cement com. (qu.)	1.00,	July 1
Superior Portland Cement Class B	0.12½,	July 20

Levi F. Carson, Quarry Veteran, Dies

ON JUNE 9 Levi F. Carson, an employe of the John T. Dyer Quarry Co., Norristown, Penn., died. He had been an employe of this company for 38 years and recently was superintendent of its Clingan quarry.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending June 25:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25653. **Limestone, broken; limestone, ground, unburned**, straight or mixed, carloads, minimum weight 50,000 lb., except when cars are loaded to cubical or visible capacity, actual weight will apply, from Rockland, Thomaston and Warren, Me., to stations on the Bangor and Aroostook R. R. (Exhibit showing present and proposed rates will be furnished upon request.) (See note 5.)

25361. **Stone chips or granules** (See Note 3), but in no case less than 60,000 lb., from Huberdeau and Lac Remi, Que., to East Walpole, Mass. Proposed—$5.30 per net ton.

TRUNK LINE ASSOCIATION DOCKET

29336. **Crushed stone**, carloads (See note 2), from Rock Hill, Penn., to White Haven, Penn., $1.20 per net ton. (See Note 5.)

Sup. 1 to 29287. **Sand**, carloads (See Note 2), from Quail Run and Pinewald, N. J., to Drummondville, Que., 33½c per 100 lb.

Sup. 2 to 29289. **Sand**, carloads (See Note 2), from Farmingdale, Lakewood, Lakehurst, Newport, Vineland and Dividing Creek, N. J., to Drummondville, Que., 33½c per 100 lb.

29349. **Trap rock, mine rock, broken stone, crushed stone and stone screening**, carloads (See note 2), from Utica, N. Y., to Clarks Summit, Penn., $1.50 per net ton. Reason: Proposed rate is comparable with rate to Elmira, N. Y.

29352. **Sand and gravel**, carload (See note 2), from Alpha, N. J., to Bethlehem and Allentown, Penn., 60c per net ton. (Present rate 70c.) (See note 5.)

29353. **Slag**, carload (See Note 2), from Bessemer, Homestead and Wylie (Clairton), Penn., to Binnewater, N. Y., $2.80 per net ton. Emergency charge to be in addition to the rate. (Present rate $3.55.) (See note 5.)

29357. **Sand, building, glass, engine, molding, ground flint, quartz and silex**, carload (See Note 2), from Granville, Horningford, Mapleton, McVeytown, Mill Creek, Newton-Hamilton, Ryde, Vineyard, Dawson Mills and Hatfield Works, Penn., to Ottawa, Ont., $5.30 per net ton. (Present rate, 34½c per 100 lb., sixth class.) Reason: Proposed rate is comparable with rate from Millville and Cape May, N. J.

29379. **Sand**, when shipped in open top cars, without tarpaulin or other protective covering, carloads (See Note 2), from Tatesville, Penn., to New Brighton, Penn., $1.70 per net ton. Reason—Proposed rate is comparable with rate to Meadow Lands, Penn., and Pittsburgh, Penn.

Sup. 1 to 29321. (A) **Sand, building**, carloads, (B) **Sand, glass, engine, molding, ground flint, quartz and silex**, in straight or mixed carloads (See Note 2), from Hancock, Great Cacapon and Berkeley Springs, W. Va., to Oakfield, N. Y. (A) $2.50 and (B) $2.75 per net ton. Also establish rate of $2.95 per net ton on **glass sand** from Gore-Triplett, Va., to Oakfield, N. Y.

29400. **Sand** (other than blast, engine, foundry, glass, molding, quartz, silex or silica), carloads (See Note 2), from Philadelphia, Penn., to Collegeville, Penn., 80c, Kratz, Penn., 85c, and Palm, Penn., 90c per net ton. Reason: (See Note 5.)

29412. To cancel rate of $2.75 per 2000 lb. on **sand, blast and glass, and ground flint**, carloads, from Hancock, Berkeley Springs and Great Cacapon, W. Va., to Salamanca, N. Y., as now published in B. & O. R. R., I. C. C. No. 22029 for Erie Railroad and B. R. & P. Ry. delivery. Class rates to apply in future. Reason: Investigation develops no traffic has moved for some time nor is there prospects for future shipments, therefore rate is obsolete.

29420 (shipper). **Sand**, carloads, minimum weight 90% of marked capacity of car, from Ernston, N. J., to Harrison, N. J., 90c, and Bloomfield, N. J., 95c per net ton. Reason: Proposed rates compare favorably with rates from Carpenterville, N. J., to Martins Creek, Glen Gardner and Bound Brook, N. J.

29186. **Sand**, building **and engine**, in open top equipment, carloads (See Note 2), from Tatesville, Penn., to Monessen, Donora, Long View, Castle Shannon, West Liberty and Rook, Penn., $1.70 per net ton, and Clairton, Large and Bruceton, Penn., $1.60 per net ton.

29425. **Slag, crushed**, in bulk in open top cars, carloads (See Note 2), from Josephine, Penn., to Barking, Cheswick, Great Belt, Kittanning, Penn., 80c, Butler and Red Bank, Penn., 90c, and Clarion, Penn., $1.40 per net ton. (See Note 5.)

CENTRAL FREIGHT ASSOCIATION DOCKET

31840. To cancel rates on **sand and gravel**, carloads, from Gravel Pit, O., to Augusta, Bradford, Carntown, Foster, Ivor, Mentor, Wellsburg and Willow Grove, Ky., 100c, Ausanba, Brashears, Dover, Maysville and South Ripley, Ky., 110c, California Dam No. 35, Glen Park, Melbourne, New Richmond, Oneonta, Ky., 90c per net ton, account no movement having been published in error.

31849. To establish on **sand** (all kinds) and gravel, carloads, from Symmes, O., in Maderia, Madisonville, Oakley, East Norwood, Norwood, Bond Hill, St. Bernard, Ivorydale Jct., Winton Jct., Cumminsville, Stock Yards, Cincinnati, Gest Street, Brighton, Winton Place, Fairmount, South Side, North Side (Cumminsville), College Hill Jct., O., 30c; Ivorydale, Elmwood Place, Carthage, Hartwell, Maplewood, Lockland, Wyoming, Park Place, Woodlawn, O., 40c; Storrs, Sedamsville, West Side, Delhi, Addyston and North Bend, O., 50c per net ton, plus emergency charge. Present rate, 80c.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

31876. To establish on **slag, coated with oil, tar or asphaltum** (the oil, tar and asphaltum not to exceed 10% by weight of the commodity as shipped), carloads, from Youngstown, O., to Spencer, W. Va., 13c, subject to emergency charge. Present—23c, subject to emergency charge.

31877. To establish on **stone, crushed** (in bulk), and **limestone, unburned, agricultural** (in bulk, in open top cars only) in carloads, from Bellevue and Sandusky, O., to South Bend, Ind. 145c per net ton, subject to emergency charge. Present—Sixth class per Official Classification, C. F. A. L. Tariff 481, I. C. C. 2445.

31884. To establish on **sand and gravel**, carloads, from Lafayette, Ind., to Thomaston, Ind., 85c per net ton. Present—102c.

31885. To establish on **pulverized limestone**, in carloads, minimum weight 60,000 lb., from Sibley, Mich., to South Bend, Ind., 170c per net ton. Present—220c.

31887. To establish on **sand and gravel**, carloads, from Connersville, Ind., to Webster and Williamsburg, Ind., 85c per net ton, and Economy, Ind., 90c, plus emergency charge. Present—230c.

31906. To establish on **sand and gravel**, carloads, in open top cars, from Massillon, O., to West Austintown, O., 80c per net ton, subject to emergency charge and to expire December 31, 1932. Present: 90c. Route—Via B. & O. R. R.-Sterling, O.-Erie R. R.

31920. To establish on **slag, crude, granulated, crushed or commercial** (the product of iron and steel furnaces), in bulk, in open top equipment, carloads, from St. Louis, Mo., and district points, to Greenwood, Ind., $1.95 per net ton, subject to emergency charge. Present classification basis.

31941. To establish on **slag, crude, granulated, crushed or commercial** (the product of iron or steel furnaces), in bulk, in open top cars, in straight or mixed carloads, from Hamilton, O., to Richmond, Ind., 70c per net ton, subject to emergency charge. Present, 95c.

WESTERN TRUNK LINE DOCKET

4781-J. **Rock, bituminous asphalt**, carloads, minimum weight 80,000 lb., except that when car of less capacity is used for carrier's convenience actual weight to apply, but not less than 60,000 lb., from Iantha, Mo., to Audubon, Carson, Cumberland, Griswold, Guthrie Center, Harlan, Indianola, Knoxville, Washington, What Cheer and Winterset, Ia. Rates: Present—Class or combination basis. Proposed—To establish $3 per ton of 2000 lb., plus emergency tariff charges.

6949-1. Rates, **stone** or **chatts, crushed**, as described in Item 3560-A, Supplement 199, E. B. Boyd's 18-M, I. C. C. No. A-1865, from Baxter Springs and Treece, Kan., to points shown below. Rates, present, class or combination basis; proposed to Groups 1, St. Louis, 12c; 2, Peoria, 15½c; 3, Chicago, 18½c; 4, St. Paul, 19½c. (Rates in cents per 100 lb.)

7844-1. Rates, **silica** (white sand), including ground silica, carload (See note 3), but not less than 40,000 lb., from Gray's Summit and Pacific, Mo., to East St. Louis, Granite City, Madison and Venice, Ill. Rates, present, 97c per net ton of 2000 lb. Emergency charge in addition. Proposed, 82c per net ton of 2000 lb. Emergency charge in addition.

7922-B. **Rates, sand, sand pit strippings**, carloads, minimum weight, same as shown in Item 1857-A of Tariff 13-P, from Red Wing, Minn., to Mason City, Ia. Rates, present, 11c per 100 lb., proposed, 7c per 100 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

24942. **Silica sand**, from Festus and Crystal City, Mo., to East St. Louis and Granite City, Ill. To establish a rate of 94c per ton of 2000 lb. on silica sand, carloads (See note 3), from Festus and Crystal City, Mo., to East St. Louis and Granite City, Ill.

Note—Rate to East St. Louis, Ill., and points within the East St. Louis, Ill., switching district, applies only for Terminal Railway Association of St. Louis or Alton and Southern R. R. delivery.

Shipper points out that there has been a reduction of 25c per ton in the rate from Ottawa, Ill., to East St. Louis, and as Festus competes with Ottawa for this traffic, it is necessary that the proposed rate be established in order to enable continued movement from Festus.

I. C. C. Decisions

24595. Bulk Lime. Prosphate Products Corp. vs. Missouri-Illinois et al. Dismissed. Rate, bulk lime, Mosher, Mo., to Charleston, S. C., not unreasonable.

24606. Crushed Limestone. Shelby County Commissioners vs. M. P. et al, dismissed. Rate, crushed limestone, Krause, Ill., to Capleville, Tenn., applicable and not unreasonable.

24728. Cement. Dewey Portland Cement Co. vs. A. T. & S. F. et al. Rate, cement, Dewey, Okla., to Madisonville and Wichita Falls, Tex., applicable. Claims on shipments, Dewey to Madisonville, and certain shipments, Dewey to Wichita Falls, barred as to all issues except applicability. Rate charged on shipments not barred, to Wichita Falls, unreasonable to the extent it exceeded 24 c., minimum 50,000 lb., subject to marked capacity of car but not less than 40,000 lb. Reparation awarded.

24099. Sand and Gravel. Missouri Gravel Co. vs. C. B. & Q. et al. Rates, sand and gravel, LaGrange and Reading, Mo., to destinations in Illinois on the Alton, unreasonable to the extent they may exceed rates shown in an appendix, not herein reproduced. This case is related to Missouri Gravel Co. vs. C. B. & Q., 132 I. C. C. 200, the rates assailed being to points on the Alton other than those embraced in that case. Commissioner Mahaffie concurred, solely, he said, for the reason that the issues appeared to be controlled by precedent in the case cited.

24393. Sand. Dresser Sand Co. vs. C. G. W. Rate, sand, Leavenworth, Kan., to New Market, Mo., unreasonable to the extent it exceeded 3.5 c. a 100 lb. Reparation of $473.68 awarded.

Suspends Proposal on Switching Rates from Gravel Plant

SUSPENSION of a proposal of the Toledo, Peoria and Western railroad to establish switching rates to apply on sand and gravel from the pit of the Kingston Lake Gravel Co., located southwest of Peoria, to Peoria was ordered vacated on June 23 by the Illinois Commerce Commission, effective June 30.

The Commission's order followed extensive hearings and a thorough investigation of the case. In its order the Commission found that on the evidence presented it should not interfere with the plan of the railroad to establish rates in an effort to move more tonnage on its tracks in competition with other railroads and other forms of transportation. The railroad was fearful that if its rate plan was destroyed the sand and gravel might be transported by barges on the Illinois River.

The Commission further held that so long as no positive showing of preference or discrimination or other violation of the law is made it should not interfere with the managerial discretion of the railroad company's officials in the establishment of rates.

Argue Louisiana Road Material Freight Rates

AT THE REQUEST of the Louisiana Highway Commission, railroads operating in Louisiana have agreed to accept warrants in lieu of cash for freight charges on road building materials. An order has been issued by the Louisiana Public Service Commission for a hearing as to the legality of this agreement. Action on this hearing has been indefinitely postponed. According to the *Traffic World*, this contest is supposedly political strategy directed at control of certain funds.

Adjourn Hearing on Gravel Rates from Buffalo-Linwood

FURTHER HEARING in dockets 14472, Dolese Brothers Co. and others against the Santa Fe and others; 16963, Automatic Gravel Products Co. and others against the Rock Island and others; 17789, Missouri Gravel Co. against the Burlington and others, and 20714, Missouri Gravel Co. against the Burlington and others, which began at Chicago before Examiner Fuller June 20, was adjourned, June 21, until July 20, when it will reconvene in Moline, Ill. Adjournment was taken following completion of the carrier testimony, which was intended to show that the Commission had prescribed rates on too low a basis for application to shipments of sand and gravel from Buffalo-Linwood, Ia., and LaGrange, Mo., to western Illinois destinations. Shippers requested additional time in which to prepare their case. The carriers are supported by Illinois shippers.

Suspends Rate Schedules on Cement

THE Interstate Commerce Commission has suspended until January 22, 1933, the operation of schedules published by New York Central railroad and the Lehigh and New England railroad proposing to reduce rates on cement from producing points in New York, New Jersey and Pennsylvania to New York City and intermediate points.

The present rate of $2 per short ton from Hudson, N. Y., and Northampton, Penn., would be cut to $1.82.—*Wall St. Journal* (New York).

Affirms Sand and Gravel Rates in Illinois

JUDGE Ray Henson in circuit court at Marion, Ill., has affirmed the schedule of rates fixed by the Illinois Commerce Commission on shipments of sand and gravel from southern Illinois deposits.—*Chicago* (Ill.) *Herald-Examiner.*

Puts Crushed Stone Rates on Mileage Basis

THE Interstate Commerce Commission has placed crushed stone rates from Rocky Point, Va., to North and South Carolina points on a mileage basis. This action was taken by the commission on complaint of the Liberty Limestone Corp. of Rocky Point, Va., that the present rates are discriminatory.—*Clifton Forge* (Va.) *Review.*

Mississippi Sand and Gravel Rates to Remain Unchanged

THE Mississippi State Railroad Commission has allowed the old intra-state rates on sand and gravel within the state to stand. Two motions to alter the rates were voted down at a recent hearing.

Producers for years have sought lower rates in view of the huge amount of gravel scheduled to be hauled within the state for the prospective highway improvement program. A year ago, the producers asked for and obtained the one-line rate.

However, later some of them declared the new rate was unfair and requested that a change be made. The railroad commission agreed to re-open but all suggestions for changes were voted down, leaving the old rate in effect.—*Meridian* (Miss.) *Star.*

Makes Recommendation in Southern Sand and Gravel Rate Case

WORK on the Southern Sand and Gravel cases, a hearing on which was held in Columbia, March 23, before Examiner Lewis of the Interstate Commerce Commission, is progressing in regular order, it was announced recently by Thomas Tatum, member of the South Carolina Railroad Commission, who received a letter from the examiner to that effect.

Mr. Lewis wrote that he was "inclined to advance a suggestion that it would be a better policy to first have Examiner Waters review the evidence and briefs and, unhampered by suggestions from any of us, prepare a tentative report; such report before issued to be submitted to your commission for study, criticism and suggestions to be followed by a conference between us all if desired prior to the services of any proposed report."

Mr. Tatum wrote Examiner Lewis that the proposed procedure was satisfactory to him.

South Carolina, among other states, is endeavoring to remove the joint differentials as pertains to the hauling of gravel over railways and to adopt a single line scale for both joint and single lines, and in the meantime to determine what the single line scale, if adopted, would be. At present a charge of 15c. per ton more is charged on gravel that is transported over two or more lines than that which is carried over a single line, although the distances may be equal.—*Columbia* (S. C.) *State.*

Increases Plant Capacity for River Shipments

THE Pittsburgh Limestone Co., a subsidiary of the United States Steel Corp., has leased 2½ acres on the Allegheny river at Kittanning, Penn., the *Kittanning Times* reports.

It is stated that the company will take over the lease at once and that work will be started immediately on the building of docks and erection of loading equipment for handling limestone. This will be brought from the deposit at Kittanning. The product has heretofore been shipped via the Baltimore and Ohio railroad.

In order to care for the increased production which will result from the use of the water shipments the company is installing new equipment at the plant. In all over $80,000 will be spent to provide increased capacity.

Trucks will be used to transport the stone to the dock on the river. This method may later be replaced by a rail system of some kind, but trucks will be used for the present so that no time may be lost in getting the river shipping into full swing.

Foreign Abstracts and Patent Review

Maximum Lime Content of Portland Cement. M. Hess describes the method and results of some of his experiments in preparing portland cements having a rate of lime saturation of nearly 100. High lime bearing and at the same time volume-consistent or sound portland cement can be obtained by the use of the fusion process, or by a great increase in the fluxing materials, or by the multiplication of the surface of the raw material to be sintered. Hess refers also to some contributions of Kuehl on the subject. Hess suggests the coefficient 2.79 for SiO_2, whereas the other two coefficients remain as used by Kuehl, so that the formula of rate of lime saturation reads now: Rate of lime saturation=

$$\frac{100\ CaO}{2.79\ SiO_2 + 1.65\ Al_2O_3 + 0.7\ Fe_2O_3}$$

There should be a clear differentiation between theoretical lime content and maximum possible lime content; and accordingly the quantity of lime which is required for the saturation of the given hydraulic factors is to be designated as the theoretical quantity of lime. If the volume consistency or soundness is just retained, then the maximum possible lime content is but slightly lower than the theoretical lime content; in other words, the maximum possible lime content cannot exceed the theoretical lime content if sound cement is to be obtained. Sound cements can be obtained easily at 100% lime saturation; but the contrast of tensile strength to compressive strength becomes too great; and above 100% lime saturation, unsoundness sets gradually in. In order to avoid confusion, only the rate of lime saturation should be used in the future.—*Zement* (1930) **20,** 40, pp. 882-884; 41, pp. 904-7.

Specific Heat of Portland Cement Clinker. H. E. Schwiete points out that there are but few references in literature to the knowledge of the mean specific heats of portland cement clinker, there being no figures at all for high temperatures. In 1901 Hart determined the mean specific heat of a cement clinker between 25 and 40 deg. C. as 0.186. In establishing heat balances, estimated figures have to be mostly used. In order to eliminate this want, the mean specific heat of a rotary-kiln clinker for temperatures of 300 to 1450 deg. C. was determined. The method and apparatus for determination are described.

The rotary kiln clinker was analyzed as follows: 0.42% loss on ignition, 22.58% SiO_2, 5.88% Al_2O_3, 3.02% Fe_2O_3, 64.95% CaO, 2.24% MgO, 0.62% SO_3, 0.43% alkalies, totaling 100.14%, with hydraulic modulus 2.06, silicate modulus 2.54, iron modulus 1.95. The mean values of specific heat from three or more individual determinations, with a deviation from the mean of less than 3%, and an absolute error of less than plus or minus 0.5% in any case, are as follows:

18- 300 deg. C.	0.2079
- 500 deg. C.	0.2202
- 700 deg. C.	0.2292
- 900 deg. C.	0.2357
-1100 deg. C.	0.2420
-1300 deg. C.	0.2545
-1450 deg. C.	0.2556

—*Tonindustrie-Zeitung* (1932) **56,** 22, pp. 304-306.

Analysis of Kiln Lining Deposit. A rotary kiln (Ruedersdorf plant) was operated under special requirements so that the temperature in the "baking-on" zone was about 1800 deg. C. (3272 deg. F.) and the zone was under fire a long time before the deposit was knocked off. This deposit showed differently colored zones parallel to the wall surface. The side exposed to the flames was pure white. The optical analysis of the white layer of clinker conformed, in its refractory index, with tricalcium silicate, and the x-ray analysis showed the same interferences as the tricalcium silicate. The chemical analysis showed the following composition: 3.2%, CaF_2, 1.39% $CaSO_4$, 87.53% $3CaO{\cdot}SiO_2$ and 4.51% $3CaO{\cdot}Al_2O_3$. These four compounds contain together 70.18% lime, whereas the chemical analysis gave a total content of 70.43%. It was shown that from an ordinary raw meal, to which calcium fluoride was added as fluxing agent, tricalcium silicate formed under the special requirements of the test kiln (low reducing burn and long influence of a high temperature). The Fe_2O_3 and Al_2O_3 is accordingly driven off in the fusion to the cooler parts of the kiln.—*Tonindustrie-Zeitung* (1932) **55,** 102, p. 1421.

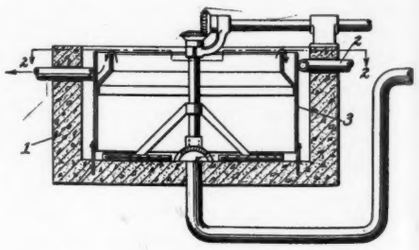
Conversion of Gypseous Semihydrate-Anhydrite. R Nacken and K. Fill present an extract from their book "Zur Chemie des Gipses" concerning the conversion of gypseous semihydrate-anhydrite in moist air at atmospheric pressure, in which they report on the method and results of tests. The investigations indicate that there are two stages of hydration of the calcium sulphate (gypsum) and the semihydrate. The semihydrate crystallizes in hexagonal columns which are bordered by rhombohedrons. The water of crystallization of the semihydrate is fixed; the dehydration can be carried out at constant temperature. The determination of the water loss of gypsum which is heated in a dry chamber without any special precautions does not lead to satisfactory results. Satisfactory curves of heating can be obtained only through slow heating. In vacuum gypsum can be dehydrated to anhydrite already at 20 deg. C. Gypsum in totally dry air at atmospheric pressure releases its water crystallization at 20 deg. C., but this change takes place only very slowly. The steam pressure curve given by D. Balarew for the transition semihydrate-anhydrite is extrapolated and verified as correct by the authors. They determined that the semihydrate is a stable hydrate of the calcium sulphate. The significance of the air for the system $CaSO_4{\cdot}H_2O$ is cleared also, and the possible course of the equilibrium curves in the diagram of the system $CaSO_4{\cdot}H_2O$ is discussed.—*Tonindustrie-Zeitung* (1931) **55,** 86, pp. 1194-1196.

German Sand-Lime Brick Plants. B. Krieger states that processes for sand-lime brick plants in Germany have recently been limited from the five or more original processes to two, namely, the lime-slaking drum process and the silo process, which to a large extent are operated automatically. The drum process is preferred for sand-lime brick plants of large output; and the silo process for plants of small output, for it is somewhat unsuited for large plants.—*Tonindustrie-Zeitung* (1932) **56,** 13, pp. 188-189.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Method of Thickening. The novel feature of the thickener shown is the circular baffle, like a tank without a bottom (3), which is set fairly close to the wall of the tank. The lower edge is raised so that solids and liquids can pass under it freely. The feed of liquid and fine solids is put in between this baffle and the tank wall through a pipe (2) which is turned so as to induce a whirling flow in this narrow space. The solids and liquid pass under the baffle and there meet the usual scraper arms or rakes used in other thickeners. The overflow goes off through a trough of the regular type on the inside of the baffle. The advantage is that the more orderly flow prevents eddies and the even settling prevents surges due to



Orderly flow prevents eddies

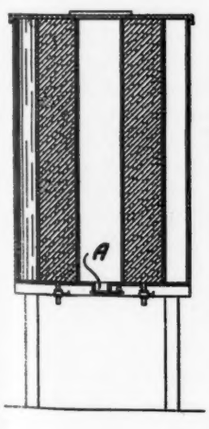
subsidence at varying velocities. *Carl H. Nordell, U. S. Patent No.* 1,815,159.

Process of Producing Lime Product. This patent describes a new process for producing a lime plaster which it is claimed is more plastic, can be applied in less time and with less skilled labor, and is also free from "popping" or "pitting" on the wall.

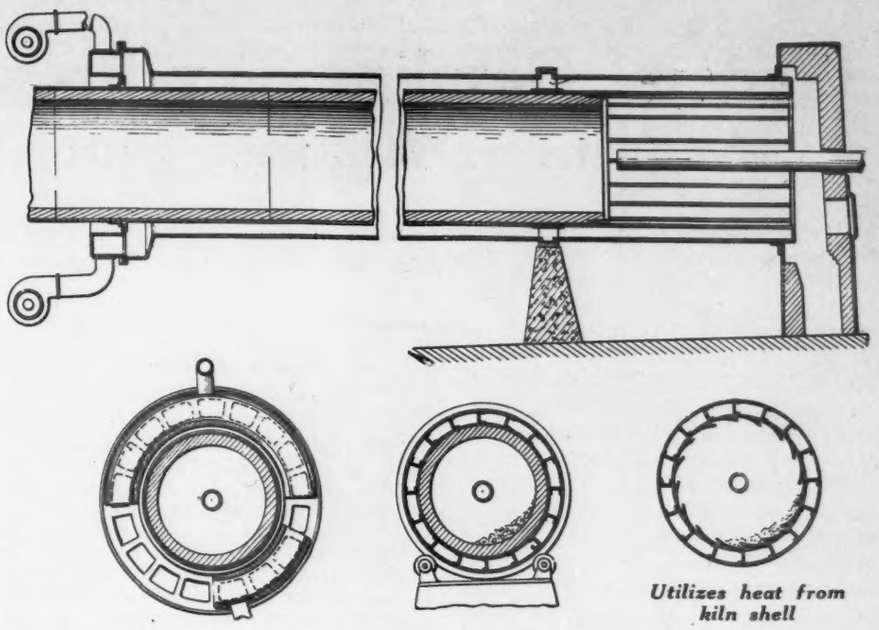
There are four steps in the process: (1) the crude quicklime is slaked; (2) the harmful qualities of slow slaking constituents are removed by any of several methods such as complete slaking, aging with or without heat, screening the thin milk of lime, flotation in water, or slaking to a dry powder and using air separation methods; (3) retarding compounds such as the chlorides of calcium, sodium, barium or magnesium, sodium carbonate, sodium hydroxide, or sodium borate, are added and thoroughly mixed; (4) the mixture is calcined to drive off the water and return it to the form of quicklime.

It is claimed to produce a product which is superior to that made from either quicklime or hydrated lime by previous methods. It is also claimed that a suitable product can be made at no greater cost from quicklimes of poor grades or those not as well calcined. The process is also applicable to the treatment of various industrial by-products which are essentially calcium hydroxide.—*Wesley C. L. Hemeon, assignor to Rockland and Rockport Lime Corp., Rockland, Maine, U. S. Patent No.* 1,856,763.

Apparatus for Aging Plastic Mixtures. The simpler of the two forms of this invention is shown here. The purpose is to control the moisture of lime putty while it is aging. The putty is put in a metal tank which is set high enough above the ground so that a truck can drive under it. A valve *A* is for loading the truck when the putty is to be delivered. There are two square boxes that go from the top to the bottom of the tank which are made loosely so that water can seep between the boards. These boxes are filled with sand and act as filters. If the putty should become so dry as not to be easily workable the drain valves from the sand filters are closed and the sand is saturated with water so that water will be taken up by the putty. The other form of the device has sand filters all around inside the tank and a filter on the bottom. *William H. Brooks and Francis M. Taylor, U. S. Patent No.* 1,810,125.



Two sand columns regulate water supply



Utilizes heat from kiln shell

Concrete Admixture Composition. The compound covered by the patent consists of:

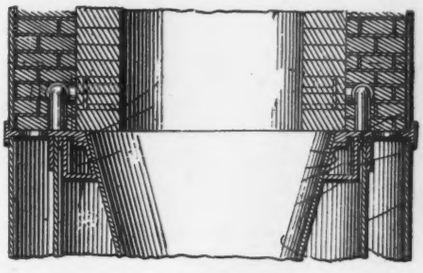
Fused resinous manganese salt	0.34%
Caustic soda solution	4.55%
Silicate of soda	1.14%
Coke oven tar or crude oil tar	93.97%

The resinous manganese salt is made by melting 12.5 lb. manganese dioxide with 250 lb. rosin; the soda solution has 2 lb. caustic soda with 5 gal. water and the silicate of soda is 30 to 60 deg. Baume. About 3 lb. (3 pints) of the mixture are used for 1 cu. yd. of concrete, adding it to the aggregate. It is claimed that this material so increases the plasticity of the mix that the water may be much less than without it, making the concrete stronger, more watertight and less liable to segregation when it is hauled to the job in trucks. It is claimed that if 3 to 10% of the mixture is used by weight of the cement a water repellent plaster is obtained, useful for waterproofing and remedial repair work.—*Claude D. Cory, U. S. Patent No.* 1,826,166.

Cement Kiln. The feature of this kiln of most importance is the method of preheating the air for combustion. This air is taken from the kiln room by blowers and passed through passages on the outside of the burning and cooling zones of the kiln. Then it is passed through the cooler and then blown into the kiln. A part of the air is passed along at high pressure and blown through the mass of clinker that is in the cooler.

Outside of the ordinary kiln shell is another metal shell the length of the cooler and the burning zone. This is held away from the kiln by channel irons which run lengthwise of the kiln, dividing the space between the kiln and the outer shell into a number of lengthwise passages. The riding ring of the kiln has holes cut in it to carry the passages by. At one end the passages connect with two wind boxes, one above and one below, the kiln. The upper wind box is connected to a blower that supplies low pressure air, the lower to a blower that supplies relatively high pressure air. In operation the blowers send the air through the passages, cooling the outside of the kiln and heating the air which then goes to the cooler. It goes into the cooler through longitudinal slots between the plates with which the cooler is lined. The cooler has a brick lined hood over it to prevent the escape of air and heat. *John C. Buckbee, U. S. Patent No.* 1,800,247.

Lime Kiln. The cooler of this shaft kiln is surrounded by a water jacket which is supplied with water kept at a constant level by any known means. The jacket is water and steam tight and pipes from the upper part go into the lower part of the kiln. The heat from the cooling lime raises the temperature of the water so that steam is formed under sufficient pressure to blow it into the kiln. As the water boils away more comes in through the automatic valve arrangement.—*William J. Kuntz, U. S. Patent No.* 1,808,851.



Water jacket on kiln generates steam

Federal Gasoline Tax Presents Another Argument Against State Diversions

Saddling of Governmental Extravagances on the Motorist, Road Building and Petroleum Industries Must Stop

THE FEDERAL GASOLINE TAX and other levies on motor necessities legalized with the passing of recent tax legislation in Congress places an added burden of $250,000,000 upon motorists, *all of whcih will be spent for something other than good roads.*

With characteristic disregard for the economics of the situation, Congress has heaped enormous new levies on the shoulders of those most heavily taxed before. And if there is warning to legislators in the present predicament it is to stop picking the motorists' pockets for purposes unrelated to roads and to halt diversion of highway funds before they carry down the great industries dependent upon the highways and bar to thousands or millions of citizens the use of roads they have already paid for.

These motor taxes for general purposes of government are about as unfair and discriminatory a type of legislation as could be found or imagined. Nobody claims that they are fair. They are presumed to be collectible and that is enough. Not only are motorists discriminated against as a class but those who are able to pay liberally are called upon for little more than the proportionately heavy levy on the owner of the humblest second-hand, drive-to-work Ford.

More for Taxes Than Gasoline

The American Petroleum Institute says in its current bulletin: "In some places in this country the motorist will pay as much in taxes as he does for gasoline and in others he actually will be paying more in taxes than for gasoline. In some cities of Alabama, for instance, the motorist will pay this gasoline tax bill:

Federal tax	1 cent
State tax	5 cents
County tax	3 cents
City tax	2 cents
Total tax bill	11 cents per gal.

In this particular state, Alabama, there has already been a shrinkage of 40,000 in automobile registrations during the last three years, equal to 12% of the 1931 registration.

The American Automobile Association estimates there will be 1,500,000 fewer cars in use in 1933 than now, largely as a result of the increase in automobile taxes. Gasoline tax collections in 1931 in states where gasoline tax rates were 5c. per gal. or higher showed an average decline of 6.6%, while the average decline in states with tax rates of 3c. or lower was only 2.32%, according to David Colby, writing in *The Annalist.*

State of Maine

Office of the Governor, Augusta
June 8, 1932

IN reply to your inquiry regarding the possibility of any diversion of gasoline tax for purposes other than road construction or maintenance, I do not think it likely that Maine would ever take such a step. Personally, I should oppose any attempt to divert this revenue from road purposes.

The reason for the imposition of the gasoline tax is to obtain funds for road work, and I believe it is a matter of good faith that gasoline users and taxpayers should see that this form of revenue remains wholly devoted to the highway program.

WM. T. GARDINER,
Governor of Maine.

Economics as Well as Fair Play Should Prevent Diversion

Mr. Colby has much to say against diversion of gasoline tax income from highways, explaining the opposition is not based solely upon the fact that diversion is unfair or that the motorist is being taxed unduly. In his opinion the basic argument is that the revenues must be spent on highways if motor traffic is to be kept at a point where revenues will not diminish.

In substantiating Mr. Colby's point it is interesting to note that Charles M. Upham, director of the American Road Builders Association, said in a recent number of *Roads and Streets:*

"In the past five years automobile registration has increased 40%, while the amount of road building has only increased 13%. Personal transportation demands a normal increase in our street and highway systems. This is evidenced by a death toll of 32,000 people (due to highway accidents) in 1930. Highway expenditures are today meagre when compared with the volume of work to be done in providing adequate arteries of transportation for continued economic progress."

Are motorists and the industries serving them unable to stem the campaign of loot so well organized against them? It appears that in their present circumstances, this is the case. If so, what is to be done? Will they continue to take it "lying down" or will they organize for successful defense?

Indiana Funds in Danger

The Indiana legislature will meet in special session next week. The main purpose of the call is to present legislation legalizing the seizure of the entire gasoline tax proceeds—lock, stock and barrel—turning them over to the counties for dissipation.

If this object is attained, which it is very likely to be unless friends of the state highway system rally to its support, the cause of good roads in Indiana will be set back several years and the motorists of the state will wake up to the fact that they are paying a heavier road tax than ever, but don't get the roads.

Florida Situation

Florida now has a 7c. state gasoline tax. Three cents is allocated to the state highway department. Three cents is returned to the various counties to retire road bond indebtedness (distribution of this money being on the basis of 1c. according to area, 1c. according to population, and 1c. to state road construction). One cent goes to the general fund of the state and is designed to relieve the real estate tax. (Entire auto license fund now goes to the schools; state highway department formerly received about 70% of this money.) The above diversions were made at 1931 special session of the legislature, the tax having been raised at that time from 6 to 7c. So the motorist pays 7c. plus 1c. federal tax and likely a 1c. city tax, or a total of 8 or 9c. per gal., in addition to his license fees, while all he gets back in the way of investment in good roads is 3c. per gal.

The legislature meets again in regular session in January, 1933. The nature of some of the proposals for dealing with the gasoline tax which probably will be received at that time may be judged by the newspaper reports of suggestions made at the recent meeting of the Florida Bankers Association.

J. H. Therrell of Ocala, Fla., chairman of the legislative committee of that association, is credited by the *Jacksonville Times-Union* with a proposal to the legislature of that state to levy a state gasoline tax of 10c. per gal. and that cities be empowered to levy a gasoline tax of 4c. per gal., the 4c. or any part of it levied to be applied as a credit on the 10c. levied by the state.

The income from these proposed levies would go to pay off the bonded indebtedness of Florida's counties, district and municipalities. Although the improvement of the

highways of the state probably has done more than any other one factor to open up the productive areas of the state and give sound value to real estate, it is insisted by Mr. Therrell that the entire highway burden be saddled upon the motorist. It was estimated that his proposed gasoline tax would bring in $9,000,000 annually.

In Georgia

Over the line in Georgia, diversionists are equally busy, although along somewhat different lines. Georgia motorists now pay 7c. per gal., 6c. to the state and 1c. to the Federal Government. During 1931 over $2,200,000 was transferred from the gasoline tax fund to the general equalization fund, for schools. Reports from Atlanta indicate that the larger cities of the state are now seeking to obtain authority to levy municipal gasoline taxes of 3c. per gal. Imposition of these taxes would force motorists of these cities to pay a total of 10c. per gal., or about a 100% tax.

The last legislature required the state highway board to purchase rentals from the state-owned railroad between Chattanooga and Atlanta, for the years 1932, 1933 and 1934, at $540,000 for each of these years.* It also required the state highway board to reimburse the counties approximately $25,000,000 advanced on highway work, on a basis of 10% annually beginning in 1936. So it is quite obvious that of the 7c. or more per gallon which motorists are forced to pay, very considerably less will go into highway improvement.

Illinois Sees the Light

Encouraging action was taken recently by the Joint Commission on Future Road Program for Illinois. Section F of its "Basic Policies" contains this paragraph: "All funds derived from motor license fees, gasoline taxes, or other motor vehicle revenues should be used solely for highway and street purposes." The commission consists of five state senators, five representatives, five citizens, the director of public works and buildings, and the chief highway engineer. The personnel of the commission is sufficient to give its statements of policy unusual weight in opposition to any further attempts to raid gasoline tax funds.

Missouri's Money Diverted

Although Missouri's state gasoline tax rate is fixed by law at 2c. per gal. for 10 years, motorists pay higher taxes because at least 55 communities levy additional gasoline taxes of their own. Twenty-four have a ½c. tax, one a levy of ¼c., and 31, including St. Louis, a tax of 1c. per gal. All are paid in addition to the state tax. The money raised has been used for general purposes of the local governments.

Mississippi Funds Scattered

The recent session of the Mississippi legislature increased the state gasoline tax from 5½ to 6c. per gal. and provided for the impounding of the extra ½c. per gal. to assure payment of current expenses. As the legislature left the situation, the amount and purposes for which various divisions of the gasoline tax fund are spent are as follows:

To amortize state highway bonds	½c.
Allotted to counties	2½c.
Allotted to state (three of the Gulf coast counties receiving half of this for shore protection	2½c.
Impounded for six months' periods to meet general obligations of the state (but sums so spent must be returned for state highway purposes)	½c.

Texas Contemplates More Diversion

In Texas definite prospects for a fight for further diversion appears imminent with the information that T. J. Cunningham, member of the Texas House of Representatives from the 106th district, has proposed a special session of the legislature for the purpose of enacting legislation permitting the diversion of gasoline tax proceeds to pay interest and provide sinking fund on county and district bonds. So it is, down the roll of states, where there has been no diversion to date, diversion of these motorist-contributed funds is being planned; in places where diversion has been accepted peaceably, further slices are about to be taken off of gasoline tax funds.

Cities and Counties Learning the Trick

Not only has the Federal Government dipped into motorists' road money on a scale which will raise the gasoline tax total of the country by about 25%, but cities and counties, also learning from state diversionists, are becoming adept. More than 125 communities of Alabama, 50 in Missouri, 3 in Florida, 1 in Louisiana, and 4 in New Mexico now levy city gasoline taxes. They have not met with the favor of the motoring public, however, especially since they increase the cost of gasoline and the revenue derived from them is not always applied to roads or streets. The uses to which the money is put vary, including general fund, fire departments, city parks, advertising, libraries, schools, salaries, pensions, debts, etc.

Refunds Boom Agriculture in Oklahoma!

In Oklahoma the amount of gasoline on which the tax was refunded on agricultural exemption during a recent 12-month period is reported to have been sufficient to run all of the gasoline-driven farm machinery in the state 24 hours a day for three years. In that same state of Oklahoma $928,000 was recently diverted from the gasoline tax fund for the distribution of seeds. It has been impossible as yet to ascertain how much of this fairly large sum went for field seeds or what proportion was expended to propagate the humble onion or to provide nosegays, but the $928,000 is gone—so far as the motorist payers of the tax are concerned—extracted from their pockets with every fill-up of gasoline.

Time to Organize?

Isn't it time that motorists and the various industries so vitally affected organize to make known the facts and propagate sound doctrine? Without corrective action highway taxation will soon be more muddled

STATE GAS TAX REVENUE PER MOTOR VEHICLE

	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
Alabama	.....	.....	8.96	11.06	11.00	11.32	24.24	24.12	24.88	24.88	29.20
Arizona	5.35	4.14	9.63	12.63	12.48	13.29	17.12	21.36	23.48	24.16	30.35
Arkansas	2.50	2.46	10.77	17.16	16.08	17.12	21.00	25.05	28.65	29.20	35.68
California	.....	.....	2.30	9.04	10.38	10.32	13.62	16.32	17.31	17.07	19.51
Colorado	3.80	3.97	4.48	8.08	8.16	8.40	11.67	13.77	17.16	19.92	20.28
Connecticut	1.31	4.50	4.84	4.50	15.22	10.22	10.84	11.20	12.34	13.62	14.07
Delaware	.....	.....	2.95	8.66	8.52	8.72	14.04	15.63	17.04	18.06	19.42
Florida	2.90	5.97	10.80	18.75	26.72	28.48	27.80	31.85	35.28	41.64	46.36
Georgia	2.30	5.15	8.64	21.81	17.82	20.33	23.52	25.84	28.50	39.00	41.50
Idaho	.....	.....	6.36	7.88	10.98	11.85	15.52	17.40	16.48	22.95	23.27
Illinois	.....	.....	.....	.....	.....	.....	4.32	.....	7.23	16.62	18.02
Indiana	.....	.....	4.98	7.56	10.56	11.61	12.45	13.56	18.00	19.60	20.91
Iowa	.....	.....	.....	.....	5.32	6.94	10.29	11.64	11.94	13.59	14.60
Kansas	.....	.....	.....	.....	6.36	8.76	9.12	10.10	14.07	15.33	14.43
Kentucky	3.25	2.90	3.43	7.23	11.61	19.20	20.70	22.15	23.25	25.40	26.92
Louisiana	.....	4.74	5.52	7.50	11.30	11.32	11.90	12.80	24.84	34.25	35.73
Maine	.....	.....	2.63	4.09	9.03	12.03	13.96	18.48	20.08	22.20	23.28
Maryland	.....	2.39	3.25	8.00	8.44	9.06	15.36	19.00	19.68	22.00	22.84
Massachusetts	.....	.....	.....	.....	.....	.....	.....	.....	11.92	12.48	18.22
Michigan	.....	.....	.....	.....	8.32	9.00	12.33	14.67	15.27	16.32	17.74
Minnesota	.....	.....	.....	.....	6.78	7.62	8.00	8.56	12.18	14.13	15.37
Mississippi	.....	3.41	4.49	12.24	14.07	19.92	22.40	22.60	28.20	29.20	32.03
Missouri	.....	.....	.....	.....	6.88	8.66	9.28	9.74	10.16	11.36	12.23
Montana	3.90	3.89	5.98	8.08	7.12	8.38	12.75	13.35	19.95	21.75	23.73
Nebraska	.....	.....	.....	.....	6.48	8.30	9.20	10.08	18.64	21.28	21.86
Nevada	.....	.....	7.38	8.98	15.04	16.88	18.28	19.40	20.44	22.76	24.18
New Hampshire	.....	.....	2.74	8.26	8.68	8.64	13.20	18.36	20.80	22.12	23.83
New Jersey	.....	.....	.....	.....	.....	.....	11.46	11.14	11.96	20.01	19.69
New Mexico	.....	7.19	5.15	4.68	10.95	13.86	23.85	27.95	29.00	32.85	32.77
New York	.....	.....	.....	.....	.....	.....	.....	.....	8.42	12.34	13.30
North Carolina	3.40	4.26	11.79	14.97	17.88	20.24	20.40	21.08	24.85	27.65	32.71
North Dakota	.....	.....	4.22	3.77	4.38	6.26	7.94	8.52	9.57	10.77	11.85
Ohio	.....	.....	.....	.....	6.68	8.96	12.66	15.09	19.28	20.96	22.99
Oklahoma	.....	.....	1.95	8.05	12.12	12.42	14.31	15.39	19.00	22.00	24.17
Oregon	7.80	8.20	11.79	14.01	13.44	14.28	14.88	16.14	16.89	24.60	22.24
Pennsylvania	1.20	3.23	5.26	7.40	6.28	8.10	11.13	13.41	20.64	16.44	18.63
Rhode Island	.....	.....	.....	.....	3.13	4.62	7.76	9.40	11.52	12.72	13.73
South Carolina	.....	8.04	11.85	14.04	22.95	24.80	25.45	25.45	29.70	28.14	35.57
South Dakota	.....	1.90	4.74	5.66	11.01	8.58	14.12	16.52	17.36	17.08	17.59
Tennessee	.....	.....	4.70	8.84	13.92	13.77	15.18	15.93	25.65	29.10	32.70
Texas	.....	.....	1.77	4.85	4.76	4.98	14.07	14.78	16.56	21.60	23.52
Utah	.....	.....	6.82	10.20	11.76	14.77	15.75	16.91	17.57	18.48	21.19
Vermont	.....	.....	3.19	3.77	7.22	7.48	11.37	12.99	18.32	21.68	23.45
Virginia	.....	.....	7.11	12.66	14.10	18.13	21.15	23.90	25.55	28.70	30.18
Washington	2.50	4.53	4.74	8.92	9.20	9.60	9.94	10.44	13.44	16.26	26.21
West Virginia	.....	.....	2.32	6.46	10.05	12.81	15.44	17.12	18.08	20.16	21.27
Wisconsin	.....	.....	.....	.....	6.78	7.88	8.64	9.24	9.44	10.64	20.92
Wyoming	.....	.....	3.52	4.59	9.57	11.40	14.55	16.95	21.36	23.52	25.56

*In ROCK PRODUCTS, June 4, it was erroneously reported that the highway department had been forced to purchase the bonds of this railroad.

than railroad rates. Highway transportation will be discouraged and curtailed. The motor fuel industry will be still further depressed. Road builders and construction material producers will further swell the ranks of the unemployed. Motor vehicle demand will decline and the cost in terms of business lost and time wasted will be beyond reckoning.

The accompanying table indicates forcefully the steady growth of the gasoline tax as it affects the individual driver and illustrates why this source of revenue has become so tempting to diversionists. For 1932 there must be added to the 1931 figures sums at least sufficient to cover the federal gasoline tax of 1c. per gal.

In Illinois, for example, the average automobile owner paid gasoline tax of $4.32 in 1927, $18.02 in 1931, and in 1932 (with the state tax remaining as in 1931) the cost per car will rise to $24.03. In Florida, the state gasoline tax cost $2.90 per car in 1921, the initial year. In 1931 the cost of the state tax had risen to $46.36 per car, and where local gas taxes of 1c. per gal. are added the cost rate was $52.98. Now add the federal tax and the presumptive rate for 1932 is about $59.60.

These 1932 references are made only as illustrative, as the actual costs per car can not be accurately computed until 1932 statistics are completed.

Recent Comment on Gasoline Tax Diversion

In many states, to aggravate these motor taxpayers and to saddle an unjust burden upon them, the funds paid as gasoline taxes are being diverted to other than highway building purposes. In Illinois several attempts have been made to spend the gas tax money in ways contrary to the platform upon which it was adopted. Even city officials have been trying to "get their finger in the pie" by seeking diversion of gas tax funds for municipal purposes. But in some of the states success has attended these efforts, and last year the state of Maryland used $75,000 of the motorists' money to promote oyster propagation. Oklahoma spent a million dollars to relieve its destitute and $928,570 more for free distribution of seed. Louisiana used $1,879,556 for port and docks board expenses. New Jersey allocated $90,000 to waterways and Mississippi spent $127,172 upon sea walls.

These scattered movements breed similar ones in the other states. And no public act could be more unfair than to levy taxes upon automobile owners to raise money to be spent for general public benefits.—*East St. Louis* (Ill.) *Daily Journal.*

* * * * *

If communities here and there hack-off highway funds and use the money for nonproductive purposes great numbers of men will be thrown out of work and society at large will find additional relief work necessary.—*Amarillo* (Tex.) *News-Globe.*

* * * * *

We have said it many times before, and it will bear repeating again: An excise tax on gasoline is justifiable only when the proceeds are used for the building and maintenance of roads.

The so-called gasoline tax is not a tax, but simply a toll, just as much as was the old toll paid to corporations that built and maintained the toll roads. The gasoline tax is paid by owners and users of automobiles to build and maintain roads, to be used for business and pleasure by them. Any of the money that is taken and used for any other purpose is robbery.—*Jackson* (Miss.) *Daily News.*

* * * * *

Cuts made by the legislative committees mean abandonment by the state of the "gentlemen's agreement" made in 1929, that all money received from the existing 2c. a gal. tax should be used for the benefit of the motorists. That agreement has been wiped out and $15,000,000 diverted to general purposes of the government exclusive of highways and parks.

Furthermore, this highway and parkway money goes more directly than any other appropriation to the employment of labor. It is proper to point out that the elimination of this money will have to be made up in some other way for the relief of the unemployment problem.—Report of Governor Roosevelt's comments on the Budget Bill, contained in the *New York Times.*

* * * * *

Nearly every voter is an automobile owner, and accordingly Texas ballots should be cast more and more in the future with an eye out for schemes threatening the interests of the motorist. The Texas highway system is being built at great cost for the future, but voters should insist upon politicians respecting the fact that it is being built with money contributed by the motorists. The large sums raised by taxes upon automobiles and motor fuel are too inviting a prey to escape the attentions of all sorts of schemers who are constantly engaged in machinations which have no other purpose than that of robbing the contributors of these funds of what is a part of their due—the return in full measure of good roads for the money contributed.

All of these schemes can mean but one thing, and that is not lower taxes but poorer roads, not promotion of the interests of motorists but a species of embezzlement of those interests. The voters of the state, who are the automobile owners of the state, should repeat at every opportunity the warning to politicians to keep hands off the highway funds, which are fairly raised only when they are fairly spent for the benefit of those who contributed them.—*Ft. Worth* (Tex.) *Star-Telegram.*

* * * * *

It would be manifestly unfair to divert gasoline tax funds to general or other purposes, and it would accomplish no useful purpose, for the reason that it would then be necessary to lay a direct levy for construction and maintenance of highways. Motorists contribute to the general revenue in the form of a personal property tax on the automobiles or trucks owned.—*C. P. Fortney, Chairman, West Virginia State Road Commission.*

* * * * *

The automobile is too much a necessity to be eliminated by taxation, but the national and state lawmakers may soon make the discovery England did. During the early days of the labor ministry, automobiles were taxed heavily according to horsepower, and petrol was called upon to pay a big share of the revenues. The automobile manufacturers met the problem by manufacturing light and economical cars . . . which relied on trick engines of amazingly low rated horsepower for their motive force. Thus the tax . . . was reduced to decent levels, but the burden all but wrecked the British export market for automobiles. Few motorists would buy the midget vehicles in other countries.—*Chicago* (Ill.) *Post.*

One inexcusable clause of the new Federal revenue bill is that imposing a tax of 1c. per gal. on gasoline.

Imposition of a federal tax, thus invading a source of revenue heretofore used only by the states, sacrifices the confidence and support of motor vehicle owners who are sadly wondering where it is all going to end. Antagonism of the bitterest kind is certain to result, especially as some of the states, including Mississippi, are increasing the gasoline tax for general revenue purposes.—*Jackson* (Miss.) *Daily News.*

* * * * *

Just why should the motor car owner assume exclusively the cost of unemployment? Gasoline is no longer a luxury, and it is a fact that 60% of the gasoline consumed is used in industrial use.—*Garfield* (N. J.) *Guardian.*

* * * * *

It apparently is becoming habit with state legislative bodies to slap another cent tax on gasoline every time there is need for additional funds, whether it be for improving conditions among the dumb animal tribes, building a sidewalk around some executive mansion, furnishing treatments for sick cows, or giving a tea party for Mrs. John Doe, who is touring this country on a good-will mission. A moderate gasoline tax, where all proceeds are returned to highway construction and maintenance, is justifiable. But when these revenues are used for other than that purpose, the tax at best is unfair.—*Nyack* (N. Y.) *News.*

* * * * *

One of the most unfair and misleading arguments in favor of a higher gasoline tax is that this is a luxury tax. The fact is that fully 60% of gasoline used in motor vehicles is for industrial use.—*Marlboro* (Mass.) *Enterprise.*

* * * * *

Users of cars are quite willing to pay for the use of good highways in a fair gas tax, but a diversion of such funds to other uses will meet with strenuous opposition.—*McMinnville* (Ore.) *Register.*

* * * * *

A tax which amounts to 20 or 30% of the price of a product—it is more than half in Georgia—is almost confiscatory, and in addition an increasing number of states have used gas tax for purposes other than roads. The motorist, once a sheep, is rapidly turning into a wolf with his eye on the legislators who are advocating higher gas taxes.—*Augusta* (Ga.) *Chronicle.*

Rules on California Cement Rates

THE California State Railroad Commission has handed down a decision in a complaint instituted by the California Portland Cement Co., the Riverside Cement Co. and the Monolith Portland Cement Co. against the Southern Pacific Co., the Los Angeles and Salt Lake Railway Co. and the Pacific Electric Co. involving rates charged by these companies from their plants to Los Angeles and Ventura county points. The decision finds that rates charged from Colton, Crestmore, Victorville and Monolith to points beyond Ventura and Ravenna are in violation of the long and short haul provisions of the public utilities act, and to that extent unreasonable. Reparation for charges in excess of the proper rate is ordered.—*Riverside* (Calif.) *Press.*

New Aluminous Cement Plant in Los Angeles

INCREDIBLE as it may seem in these days of depression in the cement industry, a new cement plant is under construction in Los Angeles and will be in operation shortly. The builder is the American Aluminous Cement Co. of America, and the plant is being built at 28th street and Pacific avenue in the port section of Los Angeles, which is the old town of San Pedro.

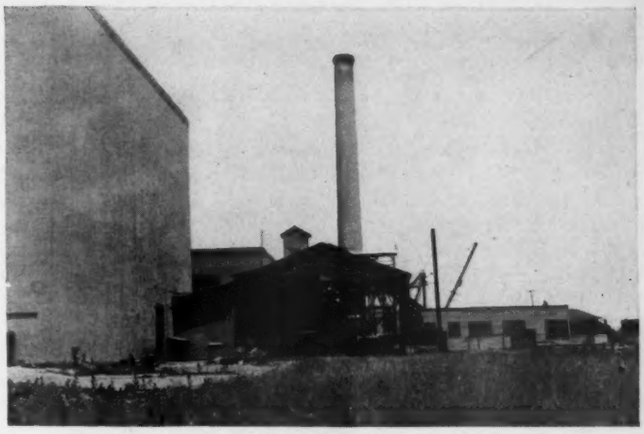
The product to be made is the aluminous cement that the French call *ciment fondu,* melted cement, and it is made under French patents. In France it is made in electric furnaces and in water-jacketed shaft furnaces of the type that has been developed for smelting lead and copper ores. It is this latter type, the water-jacketed furnace, that is being erected in San Pedro. The constructon of one unit is now advanced and this will have a capacity of 50 tons per day. The layout of the plant includes six of these furnaces. It is being built on the property of the Agricultural Potassium Phosphate Co.

The raw material is bauxite brought from Italy and one cargo was being unloaded at the time the notes for this were being made. While there is no developed bauxite industry in southern California the mineral has been found and it is reported that samples have been submitted to the new company to see if they can be used. But it is said that in general American bauxites are too high in silica for making *ciment fondu.*

At present aluminous cement has a considerable use on the Pacific Coast, especially in constructions which are exposed to the action of sea water. It is imported from Europe and brought around from the Atlantic Coast where a single American plant, that of the Universal Atlas Cement Co., Northampton, Penn., manufactures it. It has sold for as much as $13 per bbl. in Los Angeles in quite recent times.

The leaders in the new enterprise are Pierre Zucco and John H. Wong, of San Francisco. Associated with them are Arthur Webber and A. L. Kreiss, who is president of the Agricultural Potassium Phosphate Co. Mr. Zucco is a well known engineer of San Francisco. One of his constructions, the Oakland tunnel, has helped to give him an international reputation, for he is as well-known in France as in this country.

Aluminous cement, as most readers of Rock Products know, has two valuable characteristics. One is a superior resistance to the action of alkaline ground waters and sea water, for which purpose it was originally developed. The other is its quick hardening qualities in which, however, it is approached by some of the modern early-high-strength cements. Its properties of resisting corrosion in sea water have been largely overlooked in this country. Because of this resistance to salt water and acid or alkaline soil water solutions it is expected that a considerable demand for the product will develop and that the other units will be added within the present year.

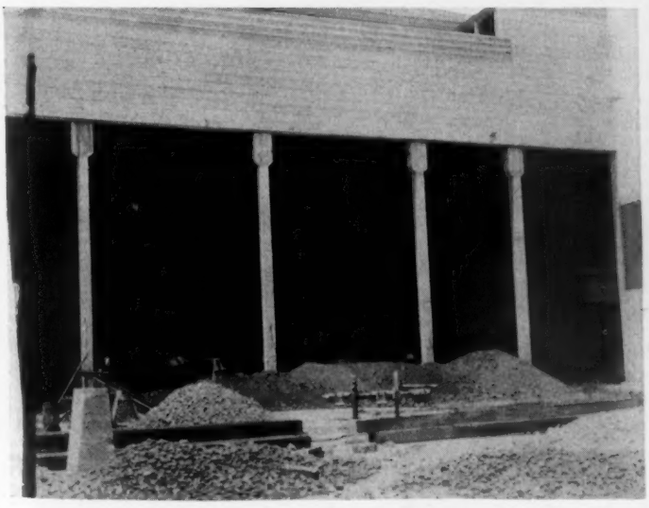


The new plant is being built on the property of the Agricultural Potassium Phosphate Co.

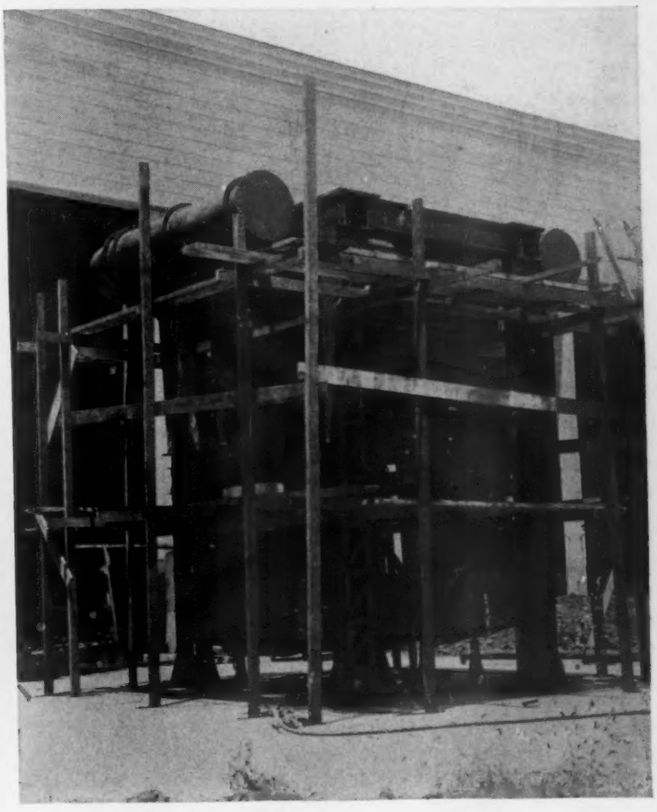
Fifteen men in three shifts will be employed in the first unit which represents an investment of $50,000, it is stated.

Later it is expected to utilize domestic bauxite obtained from sources which the company has in view, providing it tests up to the standard of the foreign product.

The offices of the company are in the Trona building, San Pedro, Calif.



Unloading Italian bauxite at the new plant



Water-jacketed furnace under construction

Merger in Phosphate Industry

(By a Special Correspondent)

MUCH INTEREST is shown in phosphate circles in the announced merger of the Armour Fertilizer Works of Chicago and the Virginia-Carolina Chemical Corp. of Richmond, Va. The new company will operate as the Virginia-Carolina Fertilizer Corp. at Richmond.

Terms of merger as announced provide an equal division of the preferred stock of the new company, with 61% of the common stock held by the Armour company and 39% by Virginia-Carolina. This would indicate control of the new organization by the Armour interests.

The combined wisdom of Judge C. G. Wilson as chairman of the board and of John E. Sanford, now of Chicago and a native of Huntsville, Ala., as president of the company, gives confidence in the future of the business for the best interests of all concerned.

It is not known as yet what definite effect will be had on the activities, plant operation and personnel of the phosphate mining departments of the two companies, but from the relative location of phosphate properties and plants of both companies it is believed that great savings can be effected by joint control management.

The Virginia-Carolina mining at Columbia, Tenn., is under the name of the Charleston Mining Co. and two large plants are operated at Arrow in the Mt. Pleasant field and at Gordonsburg in the Upper Swan Creek field, mining brown rock at the former and blue rock at the latter. The Armour Fertilizer Works operates in the Century field where a large plant is installed. Each company controls several thousand acres.

This consolidation may create an interesting situation as to the recovery of waste fines, which have been largely recovered in ordinary washing processes, merely by countercurrent decantation with ordinary classifiers, cones, thickeners and similar apparatus, all depending on the difference in gravity between the phosphate fines and impurities.

A large mining interest has developed flotation processes using a dispersal agent to separate fines and clay, with frothing and other flotation agents to remove the phosphate fines with special flotation apparatus. Use of the dispersal agent alone in the apparatus commonly used offers a possibility to accomplish the saving of previously wasted fines without recourse to the flotation installations. It is believed that such a use of silicate of soda, for instance, would be open to all and would materially increase the tonnage of deposits from which economical recovery might be made, at the same time greatly reducing the waste from ordinary washing operations.

The Phosphate Industry in June

(By a Special Correspondent)

INACTIVITY in the phosphate mining fields of Tennessee has been accentuated in the last half of June by conditions usually prevalent just before the July 1 inventory, when users put off shipments, even to routine contract withdrawals, as far as possible and spot purchases are nil. As a result, miners cut production to a minimum during the same period.

Investigations of phosphate properties and activities of takers of options on undeveloped land continue and rumors are persistent that one large holder of options in Williamson county has made a deal for a large tract of phosphate land there with an undisclosed purchaser. Considerable investigation by one user of the large furnace lump indicates it may be about ready to obtain phosphate rock reserves.

Orders for ground rock or lime phosphate for direct use are beginning to pick up and the large co-operative in the largest consuming state is said to be placing contract for this product.

Bill Permits Federal Funds for Toll Bridge Approaches

A BILL by Senator Vandenberg of Michigan extending Federal aid highways regulations to permit use of the government's share of road funds for constructing approaches to publicly owned toll bridges passed the Senate June 6 and was sent to the House of Representatives for approval. The bill is intended to facilitate construction of the proposed Port Huron-Sarnia international bridge.—*Michigan Contractor and Builder.*

A. S. T. M. Awards C. A. Menzel Medal

AT THE annual meeting of the American Society for Testing Materials, C. A. Menzel, associate engineer of the research laboratory of the Portland Cement Association, Chicago, Ill., received the Charles B. Dudley medal of the society in recognition of outstanding original research in engineering materials. The medal was awarded for a paper entitled "Tests of Fire Resistance and Stability of Walls of Concrete Masonry Units," read at the annual meeting of the society in Chicago last year.—*New York* (N. Y.) *Herald-Tribune.*

Marquette to Use Trucks for Quarry Haulage

FIVE new Sterling trucks have just been purchased by the Marquette Cement Manufacturing Co. for use in its quarry at Cape Girardeau, Mo. The machines will replace the rail locomotives formerly used to haul stone. The trucks are of 10 cu. yd. capacity and have bodies of special design.—*Cape Girardeau* (Mo.) *Missourian.*

Metropolitan Cement Corp. Buys Limestone Deposit

THE Metropolitan Cement Corp., a subsidiary of the Edison Cement Corp. of Orange, N. J., has purchased approximately 140 acres of land near Catskill, N. Y., from George W. Holdridge, the *Catskill Mail* reports.

Attorneys stated that they did not know to what use the Metropolitan Cement Corp. would put the property. Mr. Decker, an attorney, said that the land contained a large quantity of high grade cement rock.

There is an unconfirmed rumor that the company, which is a large concern, intends to erect a cement plant here. This, however, has not been officially verified.

The purchase includes the Holdridge stone quarry, the former Mildred Haner farm and the Van Orden lot. It does not include the stone crusher. The company also bought the Holdridge dock on the west side of Catskill Creek south of the bridge. Stone from this quarry was used in the Brooklyn bridge and the Manhattan bridge in New York City.

[The Metropolitan Cement Corp. recently purchased the plant of Building Materials, Inc., at New Brunswick, N. J., which it plans to convert into a cement plant, as reported in the April 9 issue of ROCK PRODUCTS.—The Editor.]

Wisconsin Maintains Road Program

THE Wisconsin State Highway Commission has announced that on June 1 it had under contract $6,577,327 in highway projects.

The program includes 319 mi. of concrete to be added to the state highway system, 31 bridge structures to be built on state trunk lines, and 263 mi. of grading and surfacing with crushed stone or gravel.

Unprecedented reduction in the price of materials is a big factor in maintaining the volume of construction this year, the commission said.

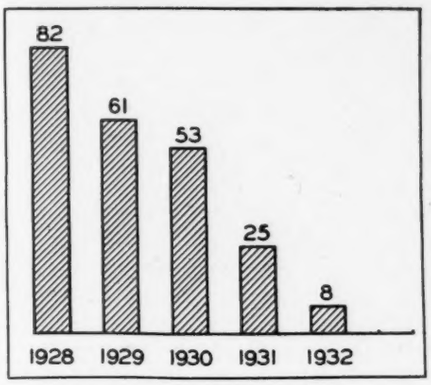
Dr. Max Polysius

DR. MAX POLYSIUS, president of the Polysius Corp., Dessau, Germany, died June 18 after an illness of several months. Dr. Polysius was widely known in Europe and had been closely connected with the portland cement industry there for many years. His name was known to portland cement manufacturers throughout the world. He made a number of visits to the United States and for several years has had an American branch of his cement mill equipment business, the Polysius Corp., Bethlehem, Penn.

In announcing the death of Dr. Polysius the company says it aims to continue to render service that will be gratifying to its business friends as well as a fitting tribute to its late president.

May Accidents in the Cement Mills

THE CEMENT MILL accident record for May, as reported by the Portland Cement Association, showed decided improvement over previous May records. During May, 1932, there were 8 lost-time and no fatal accidents. In the corresponding month of 1931 there were 23 lost-time and 2 fatal accidents.



May accidents in cement industry

While a factor in the reduction is undoubtedly the smaller number of mills operating, the May, 1932, record still shows up to good advantage after reasonable allowance is made for plants not in operation. Of the eight accidents reported, the quarry, crushing, burning, finishing, and packing departments each contributed one accident. The yard department contributed three accidents.

Glens Falls Plant Unveils Safety Trophy

ON JUNE 8, officials of the Glens Falls Portland Cement Co., Glens Falls, N. Y., employes and their friends and neighbors and invited guests, assembled at the company's plant for the unveiling and dedication of the Portland Cement Association safety trophy awarded for a perfect safety record during 1931.

George F. Bayle, Jr., vice-president of the Glens Falls company, acted as master of ceremonies. J. R. Fairman, manager of eastern offices of the association, formally presented the monument. Mr. Fairman directed attention to the outstanding record being made by the cement industry in the reduction of accidents and expressed thanks to the local plant for the help it had given and the example it had provided to others.

The monument was unveiled by David Finch Bayle, son of Mr. and Mrs. George Bayle, Jr., and was accepted for the company and its employes by President George F. Bayle, Sr. The latter was visibly gratified with the accomplishment of his organization and thanked his employes and associates for their loyalty and sustained help.

Andrew H. Thomas, councilman-at-large and acting mayor in the absence of Mayor Stickney, presented the compliments of the city of Glens Falls.

Judge Erskine C. Rogers of Hudson Falls followed Acting Mayor Thomas with an address in which he characterized the big concrete monument as the resting place not of a hero but of the monster Negligence, one of the most cruel and most baffling enemies of mankind.

Among plant men especially mentioned at the ceremony were Edward Corbett, general foreman in charge of maintenance and an employe for 32 years without an accident; F. P. Monaghan, superintendent, and Edward H. Parry, safety director, well known for the active part he has taken in the safety work of the cement industry for many years.

After the program, those present attended a gala picnic and sports event arranged in a nearby grove.

Pacific Portland Safety Team Wins State Honor

FOR THE FIRST TIME in California history, the "safety first" team of a cement company has won the championship cup, including all classifications, the honor being carried off by the team from the Pacific Portland Cement Co. of Redwood Harbor, Calif., at the First Aid Tournament held by 19 teams representing a cross section of California industry, under the joint auspices of the Society of Safety Engineers of California and the Southern California Society of Safety Engineers.

For the fifth consecutive year this company's team has won the cup in the manufacturers' section of the First Aid Tournament. The team is made up of employes

Safety team at Pacific Portland Cement Co.

coached by Harry Stephens, master mechanic. The Pacific Portland Cement Co. has just completed its fourth consecutive year without a lost-time accident.

Besides Harry Stephens, the team this year consisted of Edward Coe, John Talkington, C. Boulware, Thomas Canvin, William Norton, James Hunt, W. Stephens and Thomas Ryder.

The awards to the winners included a perpetual championship trophy in addition to the cup. Individual team members each received a cup, a gold medal, and a ten dollar gold piece.

Seriously Burned While Cleaning Boiler

TRAPPED under an avalanche of hot ashes that descended while they were cleaning out a large boiler grate, two employes of the Pennsylvania-Dixie cement plant at Clinchfield, Ga., were severely burned on June 6.

One of the men, Marvin Cooper, 35, of Clinchfield, was reported near death. The other, W. T. Hill, 42, of Perry, was burned about the face, hands and feet. Both were taken to the Oglethorpe private infirmary at Macon.

Fellow employes said that the two were cleaning out the grate of the boiler when the deluge of ashes fell, burying both. J. L. Beaver and Dan Bledsoe, also employed at the cement plant, saw the accident and rescued the victims, suffering slight burns.

Mr. Cooper, the more severely burned of the two, was seared over the major portion of his body, his face and arms. Doctors feared he had inhaled a quantity of the hot ashes.—*Atlanta* (Ga.) *Constitution.*

Safety Congress and Exhibition

THE PROGRAM for the 21st annual Safety Congress, to be held in Washington, D. C., October 3-7, is now taking shape. A five-day session, as previously, will be held. Headquarters will be at the Wardman-Park and the Shoreman hotels.

The National Safety Council announces the following new members: National Silica Co., Oregon, Ill.; Standard Silica Co., Chicago, Ill.; Wedron Silica Co., Chicago, Ill.; Ottawa Silica Co., Ottawa, Ill., and Carthage Marble Corp., Carthage, Mo.

Killed from Blast in Adjoining Quarry

AN UNUSUAL ACCIDENT occurred in a quarry near Bedford, Ky., June 15, in which Chester Adams, 51, of Campbellsburg, Ky., employe of the Kentucky Highway Commission, was killed by a falling piece of rock, following a blast, which, however, was not in the quarry in which he was working, but one nearby. The rock struck him on the head with considerable force. He was placed in an ambulance and started to Louisville, but died en route.

Decides for Cement Plant in Dust Suit

VERDICT for the defendant was returned by a jury in the Norfolk, Va., county circuit court recently in the $4000 damage suit of A. M. Newton vs. the Lone Star Cement Co., Virginia. The plaintiff alleged damage to growing plants and flowers from chemicals discharged from the stack of the cement plant.—*Portsmouth* (Va.) *Star.*

Portland Cement Production, May

THE PORTLAND CEMENT INDUSTRY in May, 1932, produced 6,917,000 bbl., shipped 8,048,000 bbl. from the mills, and had in stock at the end of the month 25,365,000 bbl. Production of portland cement in May, 1932, showed a decrease of 50.6% and shipments a decrease of 43.3%, as compared with May, 1931. Portland cement stocks at the mills were 14.2% lower than a year ago.

The statistics here presented are compiled from reports for May, received by the Bureau of Mines from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

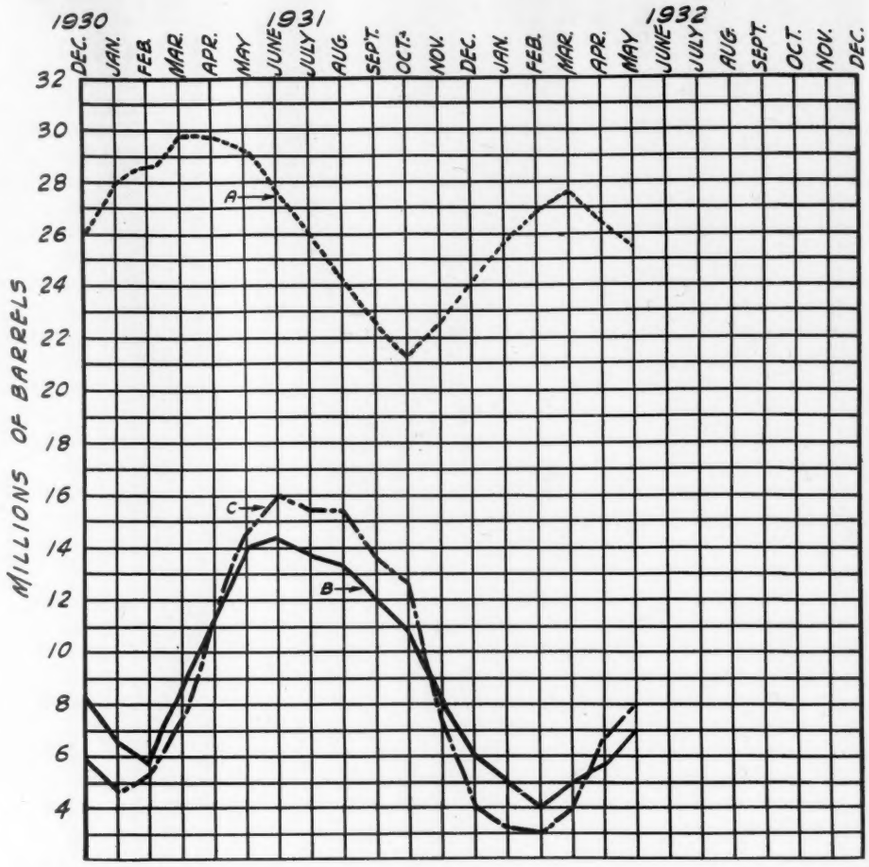
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of May, 1932, and of May, 1931. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	May		April	Mar.	Feb.
	1931	1932	1932	1932	1932
	Pct.	Pct.	Pct.	Pct.	Pct.
The month	62.8	30.2	24.8	21.3	18.7
12 months ended	56.5	38.9	41.7	43.8	45.2

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during March and April, 1931 and 1932.



(A) Stocks of finished portland cement of factories; (B) Production of finished portland conrete; (C Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN MARCH AND APRIL, 1931 AND 1932, IN BARRELS*

Shipped to	1931—March	1932	1931—April	1932
Alabama	175,601	35,482	219,593	44,565
Alaska	1,111	132	1,153	524
Arizona	53,821	20,293	47,083	15,893
Arkansas	†74,768	12,353	183,121	14,534
California	691,790	487,421	653,624	455,498
Colorado	42,724	26,601	70,204	61,974
Connecticut	82,833	42,557	150,380	94,490
Delaware	14,473	10,545	32,856	28,895
District of Columbia	76,232	68,265	119,153	97,351
Florida	49,466	31,427	61,526	39,674
Georgia	151,326	99,498	182,817	82,155
Hawaii	24,602	12,565	20,849	29,953
Idaho	16,408	10,944	21,558	12,480
Illinois	279,580	118,689	717,468	335,544
Indiana	130,801	69,500	256,697	157,969
Iowa	121,769	46,383	309,768	145,776
Kansas	133,354	55,666	184,369	126,952
Kentucky	97,970	54,024	197,013	90,728
Louisiana	216,170	72,511	277,366	58,675
Maine	19,556	6,550	36,091	26,384
Maryland	103,592	59,289	181,752	140,479
Massachusetts	151,893	94,976	279,032	209,812
Michigan	200,479	93,462	395,559	179,013
Minnesota	106,842	60,441	268,765	164,514
Mississippi	29,594	27,989	53,159	25,123
Missouri	221,789	115,809	406,831	250,745
Montana	19,072	8,164	24,187	18,034
Nebraska	58,027	35,266	131,416	68,633
Nevada	9,804	24,762	11,722	36,163
New Hampshire	11,868	7,340	30,884	23,710
New Jersey	285,359	135,539	484,331	297,700
New Mexico	23,879	19,237	30,751	24,577
New York	1,035,782	584,409	1,527,913	970,867
North Carolina	92,639	41,032	123,303	55,225
North Dakota	17,176	4,413	35,616	19,740
Ohio	308,587	166,664	491,647	310,376
Oklahoma	136,628	95,017	244,250	123,596
Oregon	84,549	56,798	105,653	71,357
Pennsylvania	458,913	227,854	697,081	427,501
Porto Rico	2,672	4,575	2,825	5,645
Rhode Island	25,935	14,861	73,310	31,523
South Carolina	214,460	56,714	234,756	55,309
South Dakota	28,631	11,565	56,775	27,070
Tennessee	91,664	53,689	151,183	98,855
Texas	428,923	384,174	524,419	403,806
Utah	28,086	10,972	31,633	15,997
Vermont	7,389	2,379	22,391	15,312
Virginia	118,992	64,153	162,050	86,856
Washington	174,642	83,502	211,323	163,168
West Virginia	70,953	44,309	92,214	65,620
Wisconsin	119,628	64,183	288,648	176,417
Wyoming	8,585	3,579	13,920	7,547
Unspecified	†16,547	8,858	19,876	24,551
	7,147,934	3,947,380	11,151,864	6,514,855
Foreign countries	44,066	25,620	32,136	21,145
Total shipped from cement p'lants	7,192,000	3,973,000	11,184,000	6,536,000

*Includes estimated distribution of shipments from three plants in March and April, 1932; from four plants in March and April, 1931. †Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production	1932	Stocks at end of month 1931	1932
January	8,129,000	6,107,000	10,384,000	8,184,000
February	7,473,000	5,176,000	11,946,000	9,375,000
March	9,586,000	5,443,000	13,318,000	10,025,000
April	11,540,000	5,924,000	13,854,000	*10,511,000
May	13,159,000	6,316,000	13,087,000	9,956,000
June	12,679,000	.....	11,837,000	.....
July	12,246,000	.....	10,209,000	.....
August	11,664,000	.....	8,468,000	.....
September	10,414,000	.....	6,918,000	.....
October	9,825,000	.....	6,021,000	.....
November	8,259,000	.....	6,215,000	.....
December	6,840,000	.....	7,035,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MAY, 1931 AND 1932, AND STOCKS IN APRIL, 1932, IN BARRELS

District	Production 1931—May—1932		Shipments 1931—May—1932		Stocks at end of month 1931	1932	Stocks at end of April, 1932*
Eastern Penn., N. J. & Md.	3,053,000	1,334,000	2,952,000	1,840,000	6,824,000	5,508,000	6,014,000
New York and Maine	1,106,000	610,000	1,137,000	742,000	2,044,000	1,792,000	1,924,000
Ohio, West'n Penn., W. Va.	1,289,000	471,000	1,252,000	642,000	3,513,000	3,018,000	3,190,000
Michigan	722,000	586,000	825,000	416,000	2,482,000	2,215,000	2,045,000
Wis., Ill., Ind. and Ky.	1,913,000	821,000	1,743,000	1,032,000	4,378,000	3,561,000	3,772,000
Va., Tenn., Ala., Ga., Fla., La.	1,418,000	718,000	1,428,000	509,000	1,630,000	1,759,000	1,549,000
East'n Mo., Ia., Minn., S. D.	1,335,000	822,000	1,538,000	1,023,000	3,862,000	3,435,000	3,636,000
West'n Mo., Nebraska, Kansas, Oklahoma and Arkansas	1,248,000	476,000	1,307,000	616,000	1,826,000	1,344,000	1,484,000
Texas	600,000	208,000	644,000	323,000	734,000	685,000	800,000
Colo., Mont., Utah, Wyo., Ida.	296,000	105,000	298,000	123,000	609,000	381,000	398,000
California	703,000	542,000	710,000	538,000	1,103,000	1,076,000	1,072,000
Oregon and Washington	327,000	224,000	366,000	244,000	549,000	591,000	612,000
	14,010,000	6,917,000	14,200,000	8,048,000	29,554,000	25,365,000	26,496,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932, IN BARRELS

Month	1931—Production—1932		1931—Shipments—1932		Stocks at end of month 1931	1932
January	6,595,000	5,026,000	4,692,000	3,393,000	27,759,000	25,778,000
February	5,920,000	3,971,000	5,074,000	3,118,000	28,612,000	26,657,000
March	8,245,000	4,847,000	7,192,000	3,973,000	29,676,000	27,545,000
April	11,245,000	5,478,000	11,184,000	6,536,000	29,715,000	*26,496,000
May	14,010,000	6,917,000	14,200,000	8,048,000	29,554,000	25,365,000
June	14,118,000	.....	16,077,000	.....	27,602,000	.....
July	13,899,000	.....	15,545,000	.....	25,934,000	.....
August	13,549,000	.....	15,172,000	.....	24,313,000	.....
September	12,092,000	.....	13,671,000	.....	22,736,000	.....
October	10,762,000	.....	12,360,000	.....	21,218,000	.....
November	8,161,000	.....	7,156,000	.....	22,219,000	.....
December	5,974,000	.....	4,142,000	.....	24,098,000	.....
	124,570,000	.....	126,465,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN MAY, 1931 AND 1932, IN BARRELS

District	1931—Production—1932		Stocks at end of month 1931	1932
Eastern Pennsylvania, New Jersey and Maryland	3,004,000	1,149,000	1,923,000	985,000
New York and Maine	1,028,000	551,000	1,403,000	950,000
Ohio, Western Pennsylvania and West Virginia	1,188,000	404,000	1,634,000	1,006,000
Michigan	577,000	618,000	1,679,000	1,231,000
Wisconsin, Illinois, Indiana and Kentucky	1,685,000	644,000	1,706,000	1,323,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	1,283,000	562,000	737,000	575,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,318,000	903,000	1,027,000	701,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	1,125,000	469,000	732,000	822,000
Texas	496,000	248,000	193,000	335,000
Colorado, Montana, Utah, Wyoming and Idaho	312,000	101,000	280,000	130,000
California	800,000	463,000	1,362,000	1,636,000
Oregon and Washington	343,000	204,000	411,000	262,000
	13,159,000	6,316,000	13,087,000	9,956,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	1931—Exports—1932 Barrels	Value	Barrels	Value	1931—Imports‡—1932 Barrels	Value	Barrels	Value
January	41,199	$ 115,678	36,704	$ 82,984	95,609	$ 120,298	14,375	$ 16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	30,123	69,451	53,333	58,576	59,392	41,487
May	48,028	140,953	.....	.....	19,325	20,568	.....	.....
June	43,597	107,610	.....	.....	32,079	42,955	.....	.....
July	29,344	97,837	.....	.....	14,332	15,582	.....	.....
August	39,517	106,643	.....	.....	8,895	11,739	.....	.....
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
	429,653	$1,220,600	.....	.....	457,238	$ 507,918	.....	.....

Exports* and Imports†

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN APRIL, 1932

Exported to	Barrels	Value
Canada	885	$ 4,320
Central America	12,882	19,536
Cuba	1,000	1,776
Other West Indies	1,094	2,156
Mexico	3,575	11,852
South America	9,306	23,577
Other countries	1,381	6,234
	30,123	$69,451

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS IN APRIL, 1932

Imported from	District into which imported	Barrels	Value
Canada	Maine and New Hampshire	8	$ 24
Denmark	Porto Rico	13,133	10,408
Japan	Hawaii	1,575	1,035
Spain	Porto Rico	6	19
U'd Kingdom	New York	44,670	30,001
Total		59,392	$41,487

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN APRIL, 1932

	Barrels	Value
Alaska	351	$ 1,062
Hawaii	16,985	37,484
Porto Rico	127,893	316,517
	145,229	$355,063

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡Includes hydraulic cement clinker, and white nonstaining portland cement.

Object to Pay Roll at Closed State Cement Plant

IN spite of legislative criticism during the recent special session, Michigan's "white elephant" cement plant at Chelsea continues with a payroll approximating $19,000 a year. The industry was ordered closed by the Legislature in 1931 and is to be abandoned in 1934 if not sold before that time.

Considerable indignation was expressed during the recent session when Representative Brown produced records showing that 17 employes were being retained at the plant at an annual cost to the taxpayers of $37,940. Yet no cement was being manufactured. At that time there were about 120,000 bbl. in storage and the employes were being retained to guard and ship it for construction projects when ordered by the state highway department.

The revelation led to an executive office inquiry and the promise by M. H. McGaffigan, superintendent of the industry, that there would be immediate payroll reductions. The governor insisted these reductions previously had been ordered.

It was brought out in the governor's inquiry that the cement on hand cost $1.50 per bbl., whereas the market then was a little more than $1.00 and the state had made purchases as low as 60c. The $19,000-a-year payroll for the inactive plant, however, will add substantially to the state's loss on the enterprise.—*Detroit* (Mich.) *Free Press.*

Proposes State Make Fertilizer Plant of Cement Plant

THE MICHIGAN state prison commission has appointed a special committee to confer with J. E. Zilk of Ann Arbor regarding his proposal to introduce the manufacture of fertilizer at the Chelsea cement plant, now idle. The committee was to report at the June meeting on the feasibility of conducting a fertilizer-making test. The Chelsea plant has been idle several months. —*Michigan Contractor and Builder.*

Starts Educational Campaign on Paper Bags

A MOVEMENT has been launched by the Associated Manufacturers of Multi-Wall Sewn Paper Bags, an organization recently formed by the leading producers of this type of package. The reasons why this container is said to be the most economical and efficient for cement and similar rock products are being presented in a series of news bulletins and through the columns of the business papers.

Report Price Advance in Cement

CEMENT PRICES were advanced on June 7 by several leading companies in Colorado, New Mexico, Missouri, Kansas, Texas, Arkansas, Oklahoma and Nebraska.

Increases varied in different sections, with a maximum advance of 35 to 40 c. a bbl. and an average of around 20 c. a bbl. The advance is regarded as a highly constructive move for the industry. — *Denver* (Colo.) *News.*

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Ready-Mixed Concrete in Brooklyn, New York

Ryan Ready-Mixed Concrete Corp. Operates Two Modern Plants

IN THE Brooklyn, N. Y., district the Ryan Ready-Mixed Concrete Corp., which is owned by N. Ryan and Co., operates two ready-mixed concrete plants. The older of these, known as the Smith St. plant, is at 491 Smith St. on the Gowanus canal. The other and newer plant, known as the Mill Basin plant, is at the foot of Flatbush Ave. at Mill Basin, some seven miles distant.

These plants are the outgrowth of the sand, gravel and crushed stone business started in 1870 at the Smith St. location by Nicholas Ryan, one of the pioneers in the aggregate business in that district. His son, Joseph J. Ryan, is vice-president of the company and in active charge of operations.

The Smith St. plant was put in operation early in 1930 and the Mill Basin plant followed in March of 1931.

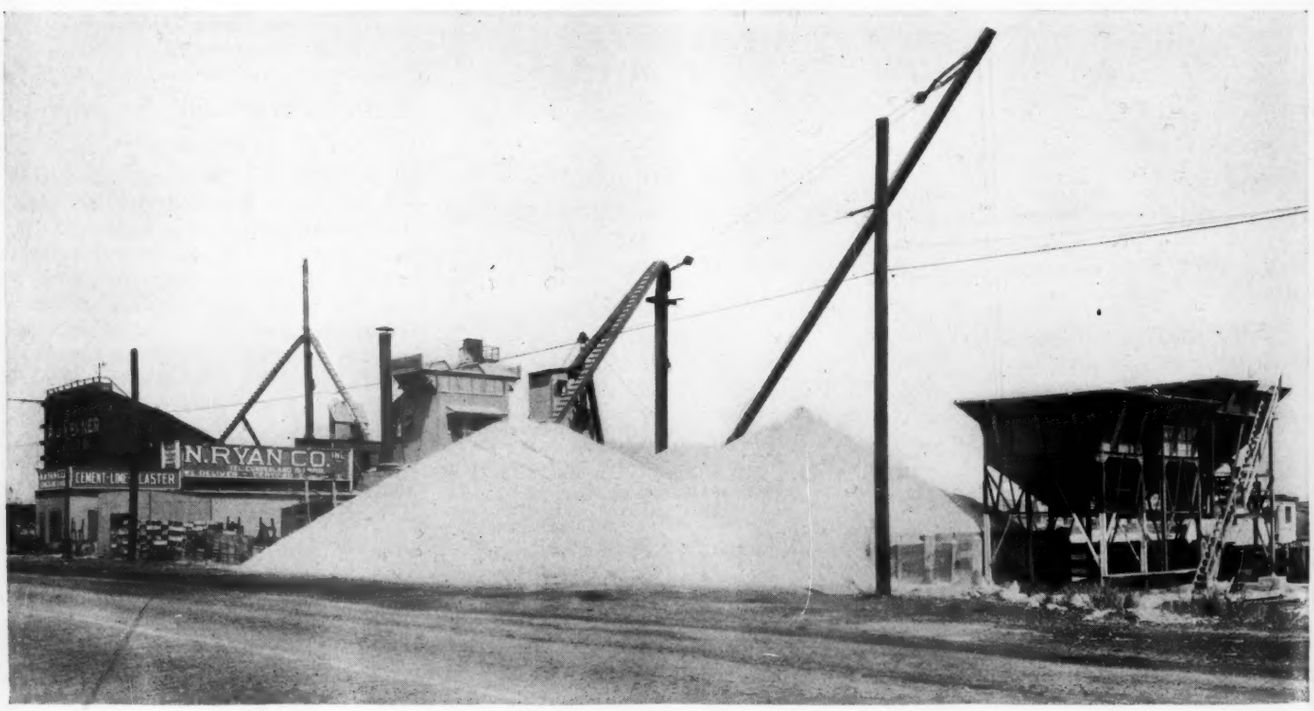
All aggregates used at both plants are brought in by barges of about 700 cu. yd. capacity which are unloaded by derricks either to stock piles alongside the plant or direct to the hoppers above the mixing plants. Stone is furnished by the New York Trap Rock Co. and sand and gravel by the Seaboard Sand and Gravel Corp.

The product is marketed as Ryan Certified Concrete and tests are carried on continuously to insure uniform high quality. This work is done by representatives of Froehling and Robertson, Inc., engineers, New York City. A considerable amount of ready-mixed concrete has been furnished by the company for subway construction and it is also being used by the Brooklyn Edison Co. for power cable ducts.

The company operates 43 trucks, 28 of which are used for the delivery of ready-mixed concrete and 15 for delivery of dry materials. About half of these are Pierce Arrow and the balance are Mack trucks. Thirteen of the trucks used for concrete have Jaeger bodies of 6-yd. agitating capacity and the other 15 have Biehl bodies, 11 being of the 5-yd. size and 4 of the 3-yd. size. The latter type have Heyl lifts for dumping.

Smith St. Plant

At the Smith St. plant the derrick with which the aggregates are handled has a Lidgerwood 3 drum hoist which is driven by a 100-hp. Fairbanks-Morse slip ring motor, an auxiliary motor driven drum hoist being used for swinging. A four compartment Blaw-Knox hopper is used above the mixer for the aggregates. This is arranged



General view of Mill Basin plant

Loading a truck at the Smith street plant

Unloading derrick at the Mill Basin plant

with lever operated quadrant gates, a 2-lever beam scale and dial on the weighing hopper.

Cement is hauled in bags to the warehouse alongside and is carried up to the cement hopper above by emptying the bags on to a short portable belt conveyor which discharges to a 12-in. Sprout-Waldron steel cased bucket elevator. The cement from the hopper is weighed in a separate weighing hopper with a Fairbanks beam scale and dial.

Mixing is done in a 3-yd. Ransome mixer. The plant has a capacity of about 65 cu. yd. of concrete per hour.

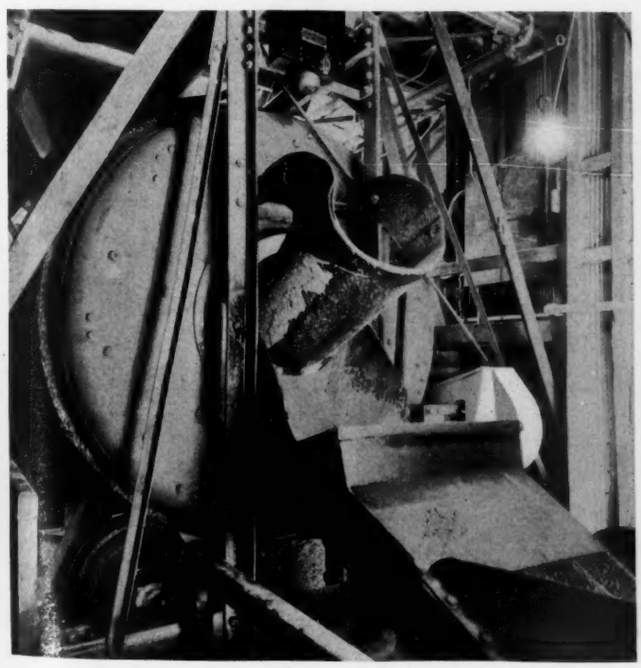
Mill Basin Plant

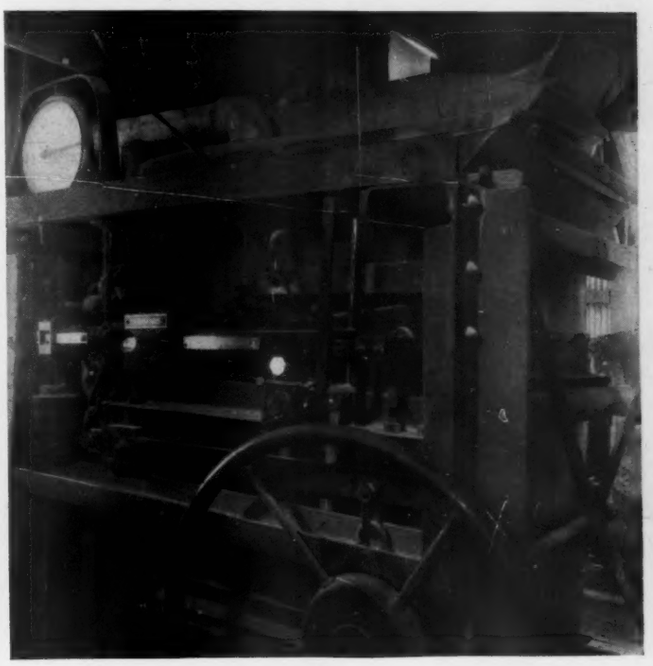
The Mill Basin plant is of particular interest because of the methods used in handling the materials. Cement is received in bulk and unloaded by the Fuller Kinyon pumping system. Weighing is done by beam scales, one of which is equipped with a photo-electric cell.

The aggregates are handled by a motor driven Lambert hoist and derrick rig having a 100-ft. boom and a 2-yd. Hayward bucket. Leschen wire rope is used. The 3-drum hoist is driven by a 175-hp. General Electric slip ring motor and a separate single-drum hoist with a 40-hp. slig ring motor is used for swinging. Both motors are arranged with General Electric controllers and a control board with magnetic contactors.

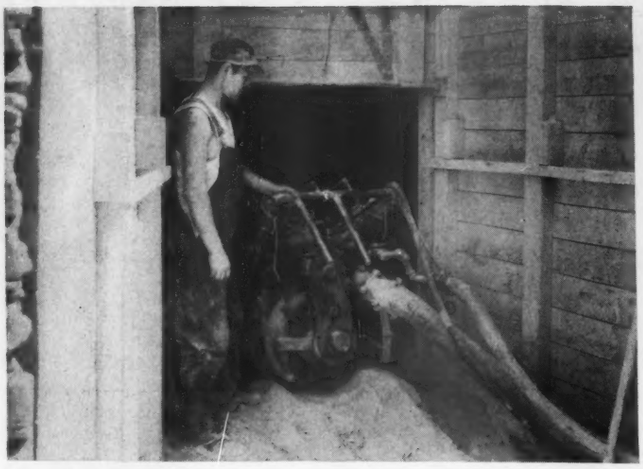
The derrick rig handles the aggregates to a Blaw-Knox 3-compartment hopper which has a capacity of about 60 cu. yd. in each compartment.

The bulk cement is received in barges having a capacity of about 1500 bbl. and is

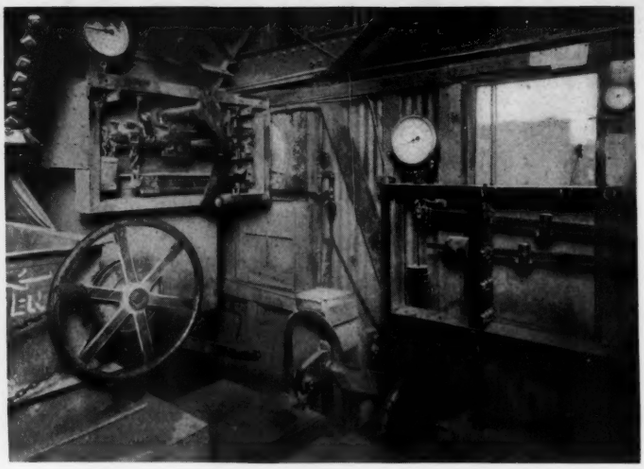




Equipment at Mill Basin plant: At left, 3-yd. mixer, and at right cement scale with photo-electric relay control



Unloading bulk cement with portable pump at Mill Basin plant



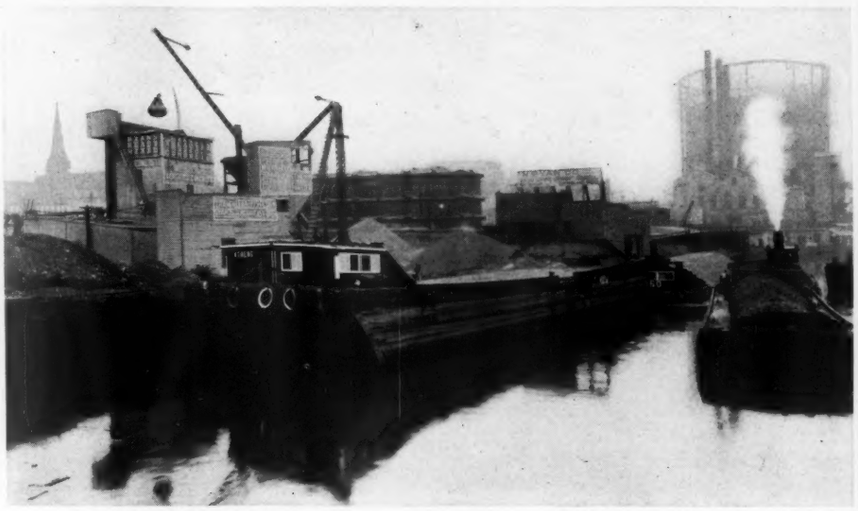
Beam scales used for weighing aggregates and cement at Smith street plant

unloaded at the rate of 130 bbl. per hour by a Fuller-Kinyon portable unloader. This delivers the cement to the hopper above the mixing plant or to either of two storage bins which have a capacity of 1000 bbl. each. Compressed air for the unloading pump is provided by a Fuller rotary compressor, driven by a direct connected Westinghouse motor.

From the storage bins the cement is handled to the cement hopper above the plant as may be required by a Sprout-Waldron steel cased 12-in. bucket elevator.

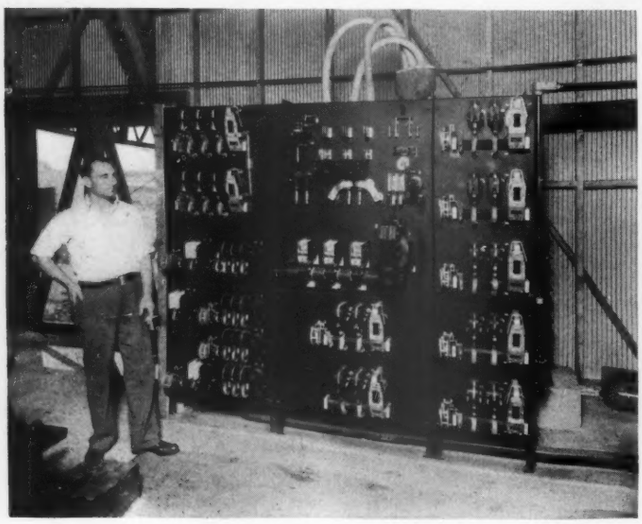
The sand and stone are weighed by a double beam Fairbanks scale and the cement by a single beam scale of the same kind equipped with a photo-electric cell or so-called "electric eye."

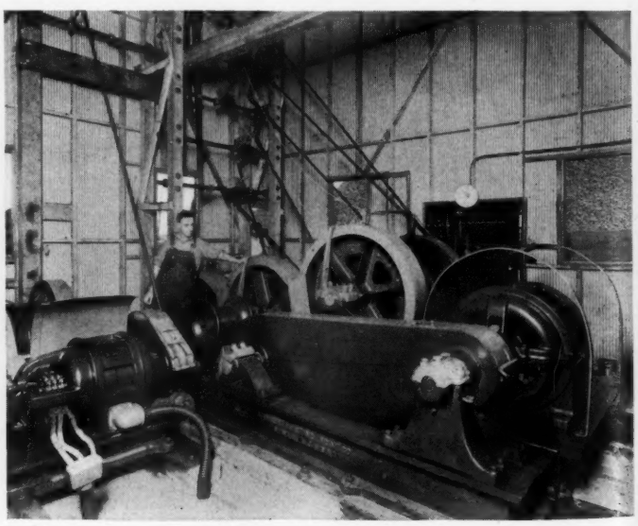
The cement from the bin above is fed to the weighing hopper by a motor driven screw conveyor and when the required weight has been reached the beam swings up and exposes the light source so that it energizes the photo electric relay. This automatically operates a relay which stops the motor and the flow of cement.



General view of Smith street plant

From the weigh hoppers the batched material goes to a 3-yd. Ransome mixer from which the finished product is spouted to trucks. The plant is capable of turning out 90 cu. yd. of concrete per hour and is operated with a total of three men exclusive of the hoist operator and one man to handle the barges.





Derrick hoist at Mill Basin plant, with drive and automatic control board

Build Plant for Agricultural Limestone

DELIVERY of crushed limestone, to be used in treating sour soil in the Willamette, Ore., valley farming sections, will be begun August 1 by the new plant being assembled near Dallas, according to announcement by Harry M. Hawkins and Max Gehlhar, director of the state agricultural department, who with a group of Portland and Salem business men have organized a company to use the limestone deposits in Polk county.

Machinery is being installed. The plant will entail an expenditure of approximately $35,000 and will produce 500,000 tons of ground limestone a year. It is estimated that a saving of 50% in cost will be made possible through eliminating freight rates now required for hauling limestone into the state.

The equipment of the plant includes a 15x36 Universal jaw crusher driven by a 75-hp. motor, a Simplicity d'Centegrator operating as a secondary crusher, and Simplicity 3-deck gyrating screens.

Those interested in the new company, including Messrs. Hawkins and Gehlhar, are William S. Walton, Salem; Ralph H. Cake, Portland; Fred Schwab, Mount Angel, and A. A. Muck, Falls City. M. B. Hamel of Falls City will be in charge of quarrying limestone for the plant. The plant is being built by L. A. Snow, Portland. Robert E. Shinn will have charge of distribution.

New Gravel Plant Starts Operation

THE NEW crushed gravel plant on Blair road, near West Jefferson, Ohio, is getting into production.

One power shovel is stripping the deposit. Another shovel is used in the gravel pits, where it delivers the gravel to the screens, from which an endless belt conveys the stone and gravel to the crusher, and from the crusher another belt conveys this material to the washer.

Wright brothers of Indiana own and operate the plant and have installed new, modern machinery in this plant. Other new machinery is yet to be installed and the plant within a few days will be operating on a 24-hour schedule.—*West Jefferson* (Ohio) *Star.*

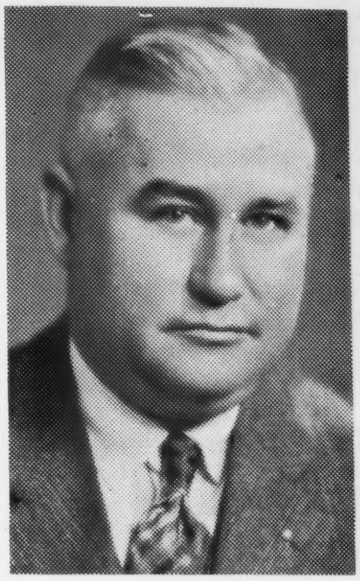
Hiram Norcross Resigns

HIRAM NORCROSS, vice-president and director of the Missouri Portland Cement Co., St. Louis, Mo., has resigned. Mr. Norcross joined the Missouri Portand Cement Co., in December, 1928. Prior to that time he was associated with the Cowham Engineering Co. and the Consolidated Cement Corp., Chicago, Ill. He also was head of the Norcross statistical bureau.

L. F. Hart Named Manager of Wabash Sand and Gravel Co.

FOLLOWING the resignation of L. R. Witty because of failing health, Louis F. Hart has been named manager of the Wabash Sand and Gravel Co., Terre Haute, Ind.

Mr. Witty has been associated with the



L. F. Hart

company for the past 25 years. It is understood that he will enter the Mayo Brothers hospital at Rochester, Minn., in the near future for treatment.

Mr. Hart has been connected with the company for the past 14 years.

Indiana Considers Rock Asphalt for State Roads

BIDS for purchase of $200,000 worth of rock asphalt were being considered by A. H. Hinkle, highway maintenance superintendent, on June 10.

Base prices range from $10 to $12 a ton delivered. The W. J. Ness Co., Mishawaka, was low bidder on eight projects, Kentucky Rock Asphalt Co., Louisville, on four, and the T. J. Atkins Co., New Albany, on one. —*Muncie* (Ind.) *Press.*

To Celebrate 90th Anniversary

JOSEPH T. RYERSON AND SON, Inc., Chicago, Ill., will celebrate its 90th anniversary on November 1, 1932. When Joseph Ryerson came to Chicago in 1842 it was a town of 8000 population.

Following an extended period of constant growth a policy of expansion was inaugurated in 1914, since which time warehouses and plants have been established in many parts of the country. Now there are nine departments of the company to serve the needs of buyers of steel, in addition to the physical equipment that has been developed. In celebrating its 90 years of growth and service the company announces it is continuing to build up and add new sizes and new lines in accordance with the policy originated in 1842.

Reports Interest in Pennsylvania Quarries

A RUMOR which has been widely circulated in Williamsburg, Penn., and other parts of Blair county, but which has thus far been unconfirmed, has it that one of the large steel companies in the Pittsburgh district has made a survey of several of the ganister stone quarries in the Williamsburg region with the object in view of resuming operations there.

At one time there were five quarries operated within the vicinity of Williamsburg. All of these have ceased operations in recent months. The last one to close down was the St. Clair Limestone Co. It is identified with the Pittsburgh Limestone Co., a subsidiary of the United States Steel Corp. interests.

It is rumored that the Jones and Laughlin Steel Corp. is interested particularly at this time in its stone quarries on the Clover Creek branch, about two miles south of Williamsburg.—*Altoona* (Penn.) *Mirror.*

Reports Local Gravel Deposits Suitable for Roads

HURON COUNTY, Ohio, commissioners recently inspected 11 local gravel deposits and after the inspection announced that available gravel deposits within the county were sufficient to meet all of the county road requirements. It is also said that the quality of local deposits is satisfactory for road surfacing. According to the *Norwalk Herald,* predictions are that at the end of this year demand for gravel for road making will show a marked gain.

Ohio Highway Department Sets Up Credit Division

THE State Director of Highways, O. W. Merrell, has announced the establishment of a credit division within the Highway Department to investigate and determine the ability of contractors and their sureties to carry out their contractual obligations.

Contracts will not be awarded or surety bonds accepted until approval is granted by the credit division, it was stated.

Reports Good Gravel Business

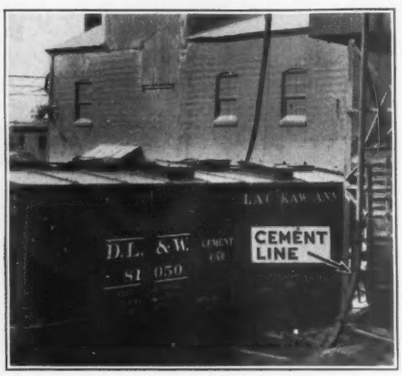
THE KILLINS Gravel Co., Ann Arbor, Mich., reports that business conditions as related to the sale of gravel have been better this past year than in 1931, the *Michigan Contractor and Builder* states. The company now has an excellent volume of business.

There has been a gradual reduction in the price of gravel during the past two years, Mr. Killins asserted. The prices now are as low as they were 10 years ago.

New Machinery and Equipment

Pump for Bulk Cement

ANNOUNCEMENT of a new low air pressure pump for handling bulk cement is announced by the Fuller Co., Catasauqua, Penn. Features of this new pump are its low pressure requirements and improved design, which are said to reduce power cost for operation for this type of pump. The new pump is said to make it practical to use bulk cement in operations with moderate cement requirements, the savings returned more than offsetting the cost of the system. The pipe line conveyor is suited to any plant layout and valves and branch lines permit delivery of any number of bins. Either gas engine or electric motor power may be used.



Low pressure requirement

The pressure ranges from 10 to 20 lb. for average installations. A number of features of the portable pump are incorporated in this new pump, including a permanently aligned screw shaft bearing assembly. An externally adjustable seal is provided. Working parts are easily replaceable.

•

Takes Over La France-Republic Truck Department

RUMORS that the Sterling Motor Truck Co., Milwaukee, Wis., was going to acquire another truck manufacturing concern have been verified by Sterling officials, who announce that negotiations have been completed for the acquisition of the motor truck division of the La France-Republic Sales Corp. of Alma, Mich. Both lines of trucks will be continued, E. M. Sternberg, president of the Sterling company, states.

•

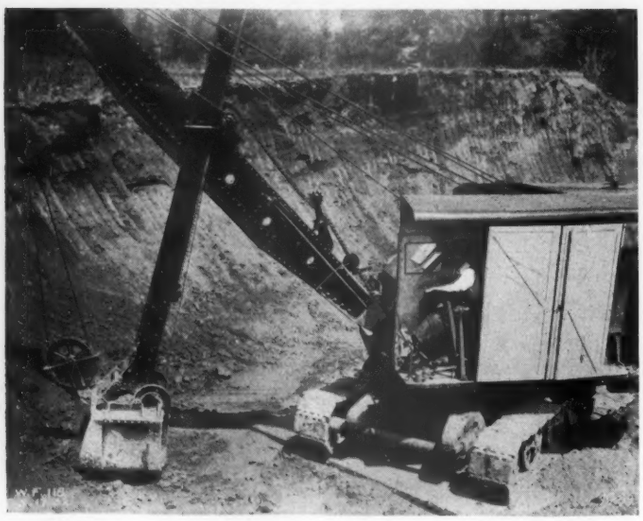
High Pressure Lubricated Valve

THE American Car and Foundry Co., New York, N. Y., announces the improved Milliken valve. A feature of this valve is that it has only seven parts. The design provides a solid head construction and no packing or gaskets are required. The valve opens and closes with a quarter turn against a positive stop. There are no seats to cut. Face to face dimensions are the same as standard gate valves. A semi-steel, nickel, chromimum composition is used for the castings.

•

Convertible Shovel

THE Keystone Driller Co., Beaver Falls, Penn., announces its 1932 Model 17 1-yd. convertible shovel. Features of this new shovel are that it provides an unusual variability in control of line speed, and that the planetary sluing mechanism provides any desired sluing speed from 0 to 5¼ revolutions per minute.



Planetary sluing mechanism

Roller and ball bearings are used in planetary gears, and under main drum and transmission shafts. The weight of the machine equipped with 18-ft. standard shovel boom and 1-yd. dipper bucket is approximately 74,000 lb.

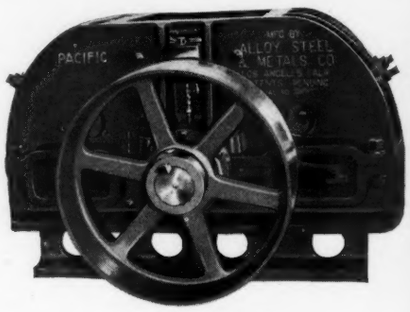
The six types of buckets or utilities available with this model require only three different booms: The skimmer-pullscoop 21-ft. double channel boom for operating the plunger type skimmer bucket and pullscoop ditching buckets; the standard shovel boom, box girder type, with split 16-ft. dipper sticks; and the 40- to 50-ft. crane boom, lattice type, special tubular construction. In addition a handy extension for the skimmer-pullscoop boom, making it either 24 or 30 ft. long, enables the operator to change quickly from either skimmer or pullscoop to clamshell operation with very little trouble or loss of time.

•

Reduction Crusher

THE ALLOY Steel and Metals Co., Los Angeles, Cal., announces the "Pacific" reduction crusher.

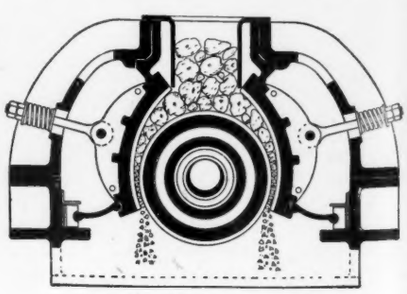
The principle of operation embodies an oscillating cylinder or mantle arranged to deliver a crushing force in all directions against two curved manganese concaves. Material entering the top of the crusher flows downward on both sides of the mantle, which does not rotate, and is crushed by compression without rubbing or abrasive action. The elimination of wear is claimed to lengthen the useful life of cylinder liner and concaves and to reduce the cost of manganese replacements.



Assembled crusher

A feature claimed for this crusher is that it can be set to produce two different sizes of rock in one operation. One side may be set for fine material and the other for a coarser product.

According to the manufacturer, a product



Mantle does not revolve

with low percentage of fines results from the elimination of rubbing and abrasion. The curved surface of the mantle and concaves, both of which are corrugated, tends to break up slabs. Short, rapid strokes are said to produce a material uniform in size and cubical in shape.

The Pacific crusher is built without gears, countershaft or oil pumps, and has but one moving part, a large eccentric shaft. Two sizes, a 4½x24 and a 4½x36, having capacities of 35 and 50 tons per hr. respectively of 1-in. material, are being manufactured.

●

Bulk Cement Scale

A SCALE designed to receive bulk cement direct from an overhead bin, weigh it, and discharge it direct from the scale into compartments or batch boxes on trucks is announced by the Richardson Scale Co., Clifton, N. J. This scale fits between the outlet of a standard bulk cement bin and the operating platform of standard bins so that no part of the scale or delivery hopper extends below the structural supporting frame of the bin.

This "Hand Fed" scale has a weigh beam with a range from 0 to 1000 lb. in 50-lb. graduations to which is connected a subsidiary beam graduated from 0 to 50 lb. A manually operated rotary inlet valve controls the flow of cement into the weighing hopper. It consists of two internal gates which are said to provide a double seal for the cement in the overhead bin in case the cement is very lively. It also permits rapid loading of the scale. The discharge gate is operated by a reversible motor. This is interlocked with the rotary inlet valve.

According to the manufacturer, all parts which might affect the accuracy of weighing are enclosed in dustproof cases.

●

Large One-Piece Belt Installation

WHAT is believed to be the largest one-piece conveyor belt installation ever made was recently installed at the Pond Creek Pocahontas Coal Corp. tipple and washery at Bartley, W. Va. The belt is carried on anti-friction idlers. The complete installation is being furnished by the Link Belt Co., Chicago, Ill.

●

Complete Line of Switches

THE General Electric Co., Schenectady, N. Y., announces its line of full voltage starters for squirrel cage induction motors is now complete for sizes up to 1200 hp., all switches conforming to NEMA requirements. Size 2 and size 3 magnetic switches are now rated as follows:

Size 2: 15 hp., 220 volts; 25 hp., 440 and 550 volts.

Size 3: 25 hp., 220 volts; 50 hp., 440 or 550 volts.

The switches include the new thermal overload relays, which follow more closely the heating characteristics of the motor than did previous types. The relay heaters on the first four sizes are now interchangeable as regards the mounting dimensions. The enclosing cases for the various switches are similar in appearance and all forms are available for installation in dusty atmospheres.

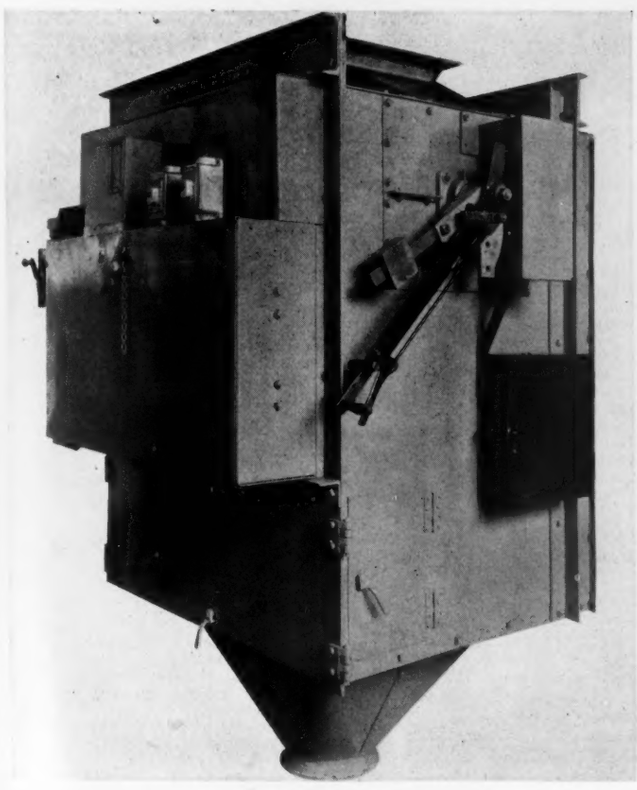
●

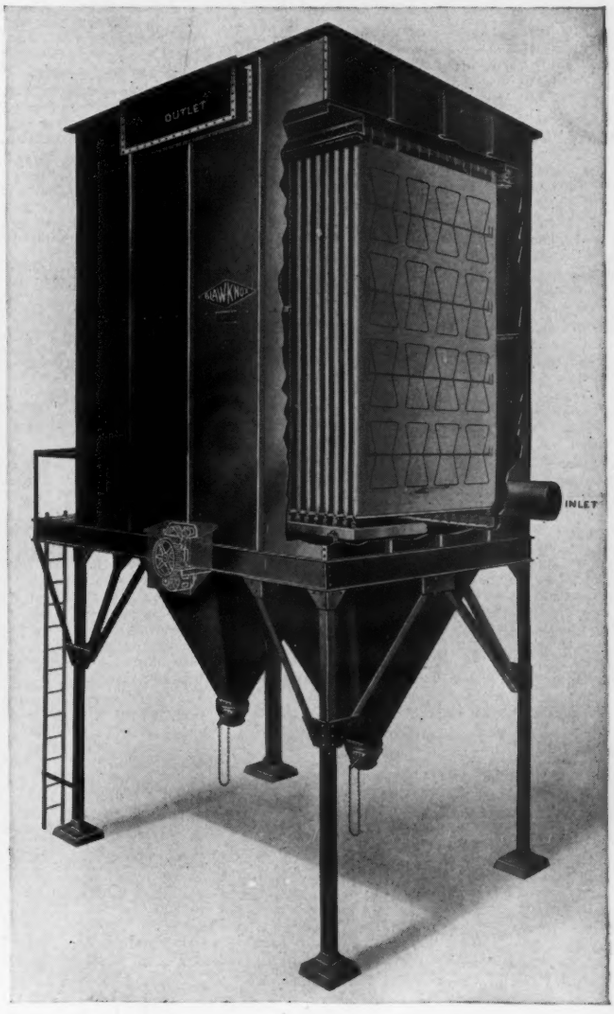
Dust Collector

THE Blaw-Knox Co., Pittsburgh, Penn., announces its new framed bag dust collectors. These collectors are said to be adaptable for use in handling all varieties of dry industrial dusts and fumes such as are encountered in plants handling, grinding, grading and processing materials. These collectors are made in pressure, suction and continuous types.

Features claimed for these collectors include: Simple wrapping type cloth bag seal, requiring no nails, tacks or screws; minimum number of parts per square foot of cloth area; minimum floor space requirements; small number of hoppers per square foot of cloth area; minimum of supplementary equipment required; low weight per unit of capacity; unique and effective cleaning mechanism; long cloth life; low erection cost; accessibility, with low maintenance cost; and simple and rapid cloth-changing arrangements.

At left—Bulk cement scale. At right — Framed bag dust collector





THE INDUSTRY

Incorporations

Aminco Corp., Philadelphia, Penn., 100 shares common. To produce asbestos, magnesia, coal, etc.

Three Rivers Sand and Gravel Co., Three Rivers, Tex., $500. E. H. Hays, B. J. Carroll, and Burrell McInerney.

National Rock Asphalt Co., Kansas City, Mo., $30,000. J. O. Miller and L. C. Miller, both of Independence, Mo.

Pyramid Cast Stone Company, Houston, Tex., $10,000. A. D. Donald, W. J. Walther and H. C. C. Lammerman.

Lannon Asphalt Products Co., Milwaukee, Wis., $25,000 authorized stock; 250 shares of $100 par value. Harry Brunn, Herbert Behrens and Harriet Behrens.

Orn O Tile Co., Inc., 400 W. Erie st., Chicago, Ill., $10,000. Emil Medins, Robert D. Elliott and Theodore C. Thon. To manufacture and deal in tiling and products.

Quarries

Inland Lime and Stone Co. is now working 24 hours a day at its Port Inland, Mich., plant.

East Butte Mining Co., Lime Spur, Mont., has resumed operations at its quarry after being closed for the past year.

McDowell Construction Co. has leased the Fullerton quarry near Princeton, Mo., and is installing crushing equipment.

Kaukauna Quarry Co., Kaukauna, Wis., is rebuilding that section of its plant that was destroyed by fire May 30.

Atlas Rock Co., Oakdale, Calif., is now working 10-hour shifts at its plant. It expects to install new screening equipment to increase plant capacity, it is reported.

Weeping Water, Neb. It is rumored that a new stone quarry will be opened in this vicinity very soon. Ole Olsen of this city is said to have been engaged as general superintendent.

Sand and Gravel

N. F. Codespoti has purchased the sand and gravel business of Samuel Crawford at Hornell, N. Y.

Jewell Frese, Spokane, Wash., is moving his sand and gravel business to a new site which he recently purchased.

Muskegon, Mich. The board of supervisors has authorized the county road commission to purchase a 20-acre gravel pit in Greenwood township.

Lake Mills, Ia. Excavation of a gravel pit has been started on the Iver Flattum farm near here for an Osage firm. The gravel will be used on road work.

Elk Grove, Calif. A new gravel pit has been opened from which requirements for road work in this district will be obtained. A crusher has been installed.

Caruthersville, Mo. A Mr. Miller from Jackson, Mo., is operating a gravel crushing plant near here from which he will supply road contractors with their requirements.

Tennessee Sand and Gravel Co. is cooperating with the Tennessee River Navigation Co. in staging excursions from Chattanooga. One of the boats of the sand and gravel company is being used for these excursions.

The T. L. Herbert and Sons interests of Nashville, Tenn., have arranged to establish a sand and gravel yard at Louisville, Ky. It is reported that one of its sand dredges will be moved to a point on the Ohio river above Louisville to supply this yard.

Cement

Wabash Portland Cement Co. was host to the Rotary Club at its Osborn plant recently.

Calaveras Cement Co., San Francisco, Calif., has opened its quarry at Old Gulch, Calif. A test run of 5000 tons of rock will be made, it is said.

Leningrad, U. S. R. R. In the first quarter of 1932 the output of cement totaled 791,000 metric tons, an increase of 49% over 1931 production for the same period.

Chicago, Ill. Among the cement plants reported to have opened recently are the Fenton, Mich., plant of the Aetna Portland Cement Co. and the Stroh, Ind., plant of the Wabash Portland Cement Co.

Cuban Portland Cement Co., a subsidiary of International Cement Corp., is reported to have stopped production recently. It is claimed the Cuban company is unable to meet the competition of cement "dumping" by Belgium and German producers.

Gypsum

Gypsum Lime and Alabastine, Canada, Ltd., has moved its Winnipeg, Man., office to the Trust and Loan Bldg.

Concrete Products

E. H. Shelton has established a concrete pipe plant at Palestine, Tex.

Columbia Sand and Gravel Co., Redman, Wash., is making concrete posts for guard rails along roads for which it has the contract to supply aggregates.

Columbia Concrete Products Co. has been organized at Wenatchee, Wash., by W. P. Hews. The plant, representing an investment of about $20,000, will produce concrete pipe.

The Concrete Masonry Association has published a manual, "Facts About Concrete Masonry," which contains condensed information on the physical and structural properties of concrete masonry.

Other Rock Products

Ohio Quartz Products Co., Jackson, Ohio, has developed an asphaltic road surfacing material.

Johns-Manville Products Corp. has been admitted to do business in Indiana. The objects as stated are to quarry and mine argillaceous limestone, asbestos and magnesia.

Seattle, Wash. A deposit of talc satisfactory for the highest grade of papers has been discovered in the Sierra Nevada mountains and is being used by the Crown Williamette Paper Co.

W. A. Eplin, Wallace, Ida., has made application for a phosphate mining lease in Granite county, Mont. The state commissioner of lands and investments says that deposits of phosphate in that section have been tested and found of a high grade.

J. D. Fairman, Harper, Ore., reports a shipment of brick made from diatomaceous deposits at Harper has been made to Seattle where it will be used in a new government building. These brick are said to have been approved by government engineers for Federal buildings.

Personals

Paul C. Hodges, vice-president of the Marble Cliff Quarries Co., Columbus, Ohio, has been elected president of the Manufacturers and Wholesalers' Association of the Columbus Chamber of Commerce.

Manufacturers

Bryant Paving Co., Waterloo, Ia., has purchased the Construction Machinery Co. and operations will begin at once, it is reported.

L. Landers and N. Segal announce the formation of the Landers-Segal Color Co., 78 Delavan st., Brooklyn, N. Y. The company will act as importers and as manufacturers' agents of pigments, chemicals and fillers.

Farrel-Birmingham Co., Ansonia, Conn., announces the appointment of Geo. L. Hurst as sales representative in San Francisco for its Buffalo division and J. R. Brown in the middle west for the sale of metal working presses.

Austin-Western Road Machinery Co., Chicago, Ill., announces an order for road machinery has been placed with it by the Pennsylvania state highway department. This is said to be the largest single order on record for big unit road machinery.

Ships train load on one order

Union Carbide and Carbon Co., New York, N. Y., will have a general exhibit in the Applied Science division at the Century of Progress Exposition to be held in Chicago in 1933. Features of this exhibit will be a "story of air" and "story of the electric furnace."

Foster-Wheeler Corp., New York, N. Y., has appointed Consolidated Steel Corp., Ltd., as exclusive sales and manufacturing representatives on the Pacific Coast. In addition to handling sales of Foster-Wheeler equipment the Consolidated Co. will manufacture much of the equipment installed in the Pacific Coast territory.

Young Radiator Co., Racine, Wis., announces appointment of L. M. Young as works manager in charge of the manufacturing plant and of development work of the company. Mr. Young was formerly with the Mueller Brass Co., with the Nizer Corp. and with Packard Motor Co.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention Rock Products.

Trench Hoes. Circular describes new type of ditcher. BAY CITY SHOVELS, INC., Bay City, Mich.

Buckets. Bulletin discusses features of the new Williams "Champion" buckets. WELLMAN ENGINEERING CO., Cleveland, Ohio.

Wire Rope. *Wire Engineering* continues discussion of lubrication of shaft hoist ropes. JOHN A. ROEBLING'S SONS CO., Trenton, N. J.

Conical Scrubber. Bulletin describes Hardinge conical scrubber for cleaning aggregate and shows installations. HARDINGE CO., INC., York, Penn.

Portable Cranes. Booklet illustrates many applications of "Loadmaster" in handling materials and equipment. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Trailers and Crawlers. Bulletins 507 and 508 give data on "Forged-Trak" bottom dump trailers and wheels. ATHEY TRUSS WHEEL CO., Chicago, Ill.

Explosives. Booklet discusses the use of explosives in operations where caution must be used to protect forests from fire. ATLAS POWDER CO., Wilmington, Del.

Lubrication. June, 1932, issue of *Lubrication* has article on worm reduction gear lubrication discussing selection of worm gear lubricants. TEXAS CO., New York, N. Y.

Industrial Lubrication. *Alemite Industrial Lubrication* for May, 1932, discusses application of industrial systems to printing machinery. ALEMITE CORP., Chicago, Ill.

Shovels. *Center Drive* illustrates various operations in which Lorain and Universal shovels have served. UNIVERSAL CRANE CO. and THEW SHOVEL CO., Lorain, Ohio.

Testing Equipment. Circular describes model BP-4 hydraulic materials testing machine made in 60 and 300 ton capacities. STEEL CITY TESTING LABORATORY, Detroit, Mich.

Quarry Plants. Catalog 267 B describes, with drawings, a number of quarry plant designs and gives information as to operation. SMITH ENGINEERING WORKS, Milwaukee, Wis.

Air Separator. Folder describes the 1932 model Sturtevant air separator. Air separation principles and their application in the Sturtevant separator are explained. STURTEVANT MILL CO., Boston, Mass.

Shovels and Cranes. Publication gives detailed explanation and description of Byers shovels and cranes. Specifications on construction of equipment is included. BYERS MACHINE CO., Ravenna, Ohio.

Rotary Compressors and Vacuum Pumps. Bulletin C 3 discusses single and two-stage compressors and vacuum pumps. Illustrations and specifications of various types are given. FULLER CO., Catasauqua, Penn.

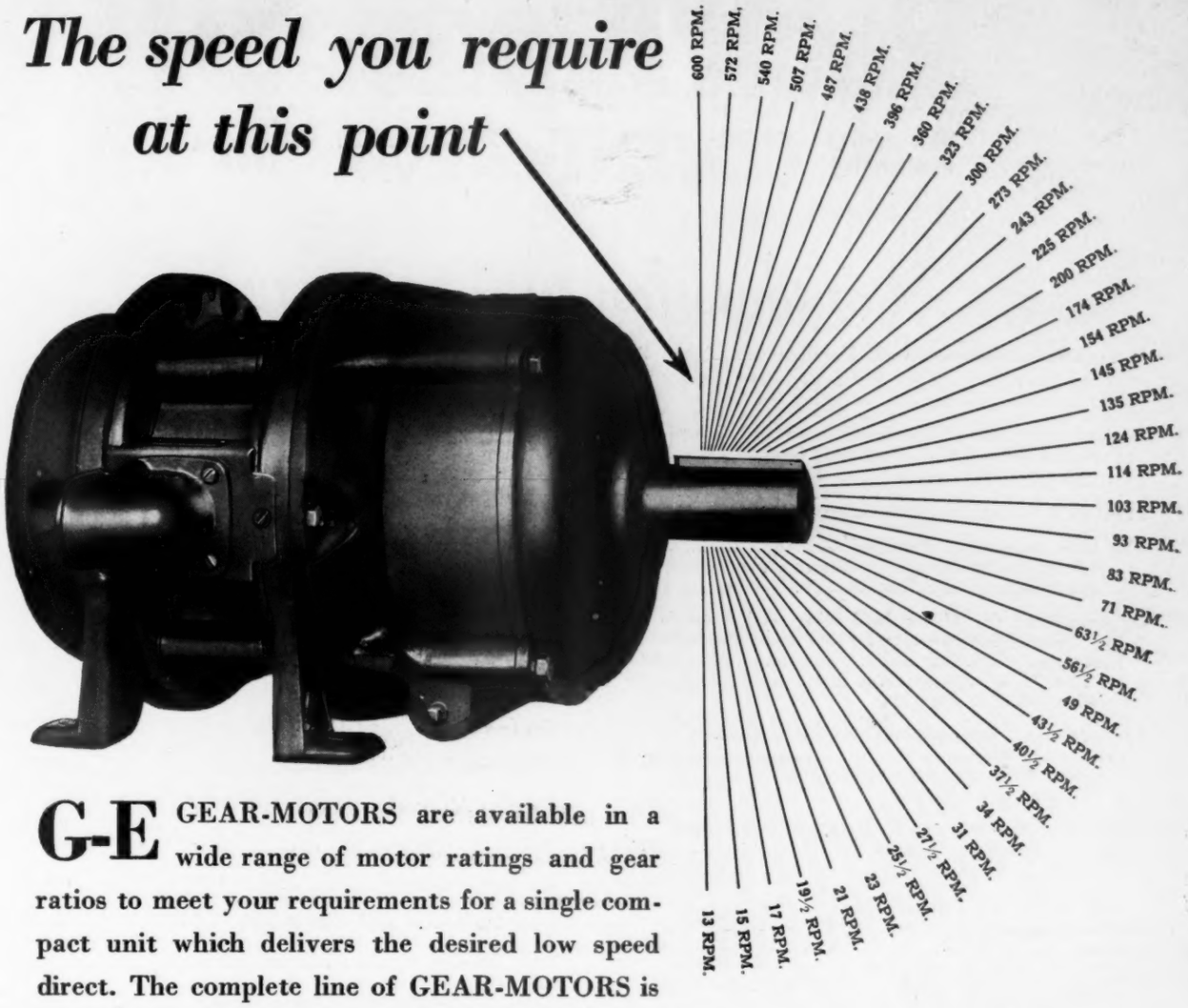
Electric Locomotives. Catalog 1245 shows storage battery locomotives, trolley locomotives and combination locomotives for all kinds of service. Illustrates types and models most widely used and gives specifications. ATLAS CAR AND MANUFACTURING CO., Cleveland, Ohio.

Materials Handling by Air. Catalog gives detailed information on mechanical air separation, vacuum air separation, air drying, air conveying, dust collecting systems, special operations and typical installations. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Pumps and Compressors. Bulletin D-450-B7 shows installations and cross-section views of vertical sump and irrigation pumps. **Bulletin W-850-B5** shows mechanical features and mountings for portable air compressors. **Bulletin W-321-S1A** gives pump combinations with motor characteristics of monobloc type centrifugal pumps. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

G-E GEAR-MOTORS

The speed you require at this point



G-E GEAR-MOTORS are available in a wide range of motor ratings and gear ratios to meet your requirements for a single compact unit which delivers the desired low speed direct. The complete line of GEAR-MOTORS is based on proved designs of standard, general-purpose motors and efficient, internal helical gearing.

The G-E GEAR-MOTOR delivers the full rated horsepower of the motor at the output shaft. The complete unit is only slightly larger than an ordinary motor and is easily installed.

Complete information can be obtained from the nearest G-E sales office, or General Electric Company, Schenectady, N. Y.

STANDARD RATINGS

600 to 13 Rpm.
Polyphase, 3/4 to 75 hp.
Single-phase, 3/4 to 5 hp.
Direct Current, 3/4 to 7 1/2 hp.

Other speeds and horsepower ratings can be furnished on request. Mechanical modifications are available, such as flange mounting, vertical motors, etc.

Speed adjustment can be obtained by selecting a motor with the necessary electrical characteristics.

201-230

GENERAL ELECTRIC

Recognized the World Over as the Leader in Its Field

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Entered as second-class matter, July 2, 1907, at the Chicago, Ill., postoffice under the Act of March 3, 1879. Copyrighted, 1932, by Tradepress Publishing Corporation

Contents for July 16, 1932

Merger Makes Improvements Possible 7-10
Chemical Lime Co., Bellefonte, Penn., makes numerous changes over past two years.

Method and Cost of Dredging Sand and Gravel, Portland Gravel Co., Portland, Ore. 11-14
By Howard F. Puariea.

Plant to Broaden Credit Structure 15

The Manufacture of Portland Cement 16-17
Part V—Cement composition and constituents. (Continued.) By S. E. Hutton.

Opportunities for Using Indicating and Recording Control Instruments in the Rock Products Industries 18-21
Part IX—Instrumentation in the glass industry. By James R. Withrow.

Production of Aggregates from River Gravels in the Plains Region 22-25
Part III—Dredging methods and power. By John H. Ruckman.

The Recast Analysis and Its Relation to the Chemistry of Portland Cement 26-27
Part II—Meaning of recast analysis. By Louis A. Dahl.

Southern Concrete Plant with Discriminating Name 44-46
T. L. Herbert and Sons operate "Continuous Mix" concrete plant at Nashville, Tenn. By Frances Sinclair.

Hard-Surface Alloys Reduce Crushing Plant Repair costs 47-49
By Charles Jenkins.

Lubrication of Wire Ropes 50-51
By James I. Clower.

Departments

Chemists' Corner 26-27

Hints and Helps for Superintendents 28-29

Rock Products Clinic 30

Editorial 31

Financial News and Comment 32-33

Traffic and Transportation 34-35

Foreign Abstracts and Patent Review 36-37

Safety Campaigns 42-43

Cement Products 44-46

New Machinery and Equipment 52-53

The Industry 55

Classified Directory of Advertisers 56-57

(Rock Products is indexed in the "Industrial Arts Index," which can be found in any Public Library)

TRADEPRESS PUBLISHING CORPORATION

542 South Dearborn Street, Chicago, Illinois, U. S. A.

Nathan C. Rockwood, President; Fred S. Peters, Vice-President
T. I. McKnight, Secretary I. H. Callender, Treasurer

NATHAN C. ROCKWOOD, *Editor and Manager*
EDMUND SHAW, Los Angeles, Calif., *Contributing Editor*
EARL C. HARSH, WALTER B. LENHART, H. O. HAYES, *Associate Editors*

A. M. STERN, *Assistant Editor*
FRED S. PETERS, *Advertising Manager*
JOS. J. KOLAR, *Production Manager*

E. H. PAULL, *Eastern Representative*
250 Fifth Ave., New York City. Tel. Ashland 4-4723

GEORGE M. EARNSHAW, *Central Advertising Manager*
522 Citizens Bldg., Cleveland, Ohio. Main 2559

CARL L. WALKER, *Western Representative*
Chicago. Tel. Wabash 3714-3715

SUBSCRIPTION—Two dollars a year to United States and Possessions. $4.25 a year to Canada (including duty) and $4.00 to foreign countries. Twenty-five cents for single copies

TO SUBSCRIBERS—Date on wrapper indicates issue with which your subscriptions expires. In writing, to have address changed, give old as well as new address

The A. B. P. is a nonprofit organization whose members have pledged themselves to a working code of a practice in which the interests of the men of American industry, trade and professions are placed first—a code demanding unbiased editorial pages, classified and verified paid subscribers, and honest advertising of dependable products. The A.B.C. is an organization which audits and verifies publishers' circulation claims and records.